BEFORE THE
POSTAL REGULATORY COMMISSION
WASHINGTON, D.C. 20268-0001

FIRST-CLASS MAIL AND PERIODICALS
SERVICE STANDARD CHANGES, 2021

Docket No. N2021-1

NOTICE OF DESIGNATED MATERIALS & DECLARATION FOR
UNITED STATES POSTAL SERVICE WITNESS THOMAS THRESS
(June 7, 2021)

Pursuant to the Presiding Officer's Ruling No. N2021-1/11 (May 25, 2021) and

N2021-1/16 (June 4, 2021), the United States Postal Service hereby provides this

Notice of filing designated materials for Postal Service witness Thomas Thress.

Pursuant to the rulings, attached to this Notice are: (i) a declaration of witness Thress

supporting the authenticity of his testimony, the library reference accompanying his

testimony, and his designated responses to interrogatories and Presiding Officer

Information Requests; (ii) the testimony of witness Thress (with corrections highlighted);

(iii) an index of library references sponsored by witness Thress; and (iv) the designated

responses of witness Thress (with corrections highlighted) in alphabetical order by party

name and by numerical order of request.

Respectfully submitted,

UNITED STATES POSTAL SERVICE

By its attorneys:

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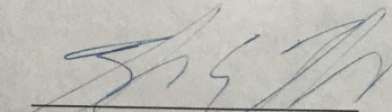I hereby declare, under penalty of perjury, that:

The Direct Testimony of Thomas E. Thress on Behalf of the United States Postal Service, USPS-T-5 was prepared by me;

if I were to give this testimony before the Commission orally today, it would be the same; and

the library reference marked as USPS-LR-N2021-5 was prepared by me or under my direction; I sponsor Library Reference USPS-LR-N2021-5.

I prepared the interrogatory responses, and responses to the Presiding Officer's Information Requests, which were filed with my authorization and which have been designated for inclusion in the record in this docket; and

If I were to respond to these interrogatories and Presiding Officer's Information Requests orally today, the responses would be the same.

_____
Thomas E. Thress

DATE: 6/7/2021

BEFORE THE
POSTAL REGULATORY COMMISSION
WASHINGTON, D.C. 20268-0001

FIRST-CLASS MAIL AND PERIODICALS SERVICE STANDARD CHANGES, 2021	Docket No. N2021-1

DIRECT TESTIMONY OF
THOMAS E. THRESS
ON BEHALF OF THE
UNITED STATES POSTAL SERVICE

(USPS-T-5)

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Supporting Documentation

The following USPS Library References are associated with my testimony:
Library Reference LR-N2021-1-5: Econometric Analysis of Impact of Delivery Service Standards on First-Class Mail and Periodicals Mail

DIRECT TESTIMONY OF
THOMAS E. THRESS

<u>AUTOBIOGRAPHICAL SKETCH</u>

My name is Thomas E. Thress. I am a Vice-President at RCF Economic and

Financial Consulting, Inc., where I have been employed since 1992. As a Vice

President at RCF, I have major responsibilities in RCF's forecasting, econometric, and

quantitative analysis activities.

My most recent appearance before the Postal Regulatory Commission was in

support of the Postal Service's request for exigent rate relief in R2013-11. My testimony

in that case quantified the impact of the Great Recession on mail volumes.

I testified to the volume forecasts underlying the Postal Service's case in the last two

omnibus rate cases prior to the enactment of the Postal Accountability and

Enhancement Act (PAEA): Docket Nos. R2006-1 and R2005-1. Prior to this, I testified

regarding the demand equations underlying the volume forecasts for all mail categories

except for Priority and Express Mail in Docket Nos. R97-1, R2000-1, and R2001-1. I

have also appeared as a rebuttal witness for the Postal Service in Docket No. MC95-1

and submitted written testimony for the Postal Service in Docket No. MC97-2.

I have had primary responsibility for the econometric analysis underlying Dr. George

Tolley's volume forecasting testimony since Docket No. R94-1.

Since the implementation of the PAEA, I have been the primary author of the Postal

Service's annual submissions to the PRC regarding the Postal Service's econometric

demand equations. The most recent of these filings was made on January 20, 2021.

I received a Master's Degree in Economics in 1992 from the University of Chicago. I

received a B.A. in Economics and a B.S. in Mathematics from Valparaiso University in

1990.

1   **PURPOSE AND SCOPE OF TESTIMONY**

2   The purpose of this testimony is to provide an estimate of the potential loss of First-

3   Class Mail and Periodicals Mail volumes resulting from the changes in service

4   standards being proposed by the United States Postal Service.

1   **I.   Overview of Approach Taken**

2   I was asked by the Postal Service to estimate the potential impact of proposed

3   changes to service standards on First-Class Mail and Periodicals Mail volumes. To

4   address this question, I estimated the historical relationship between mail volumes and

5   average days to delivery via econometric analysis. The resulting coefficient(s) from this

6   analysis were then applied to estimates of the change in average days to delivery

7   resulting from the Postal Service's proposals in this case.

8   Section II below presents the results of my econometric analysis. Section III uses the

9   econometric results from Section II to estimate the financial implications of the service

10   standard changes being proposed in this case.

1 **II. Econometric Results**

2 **A. General Overview**

3 The Postal Service estimates a set of econometric demand equations which relate

4 mail volumes to factors which have influenced mail volumes historically, such as postal

5 prices, the macro-economy (e.g., employment), and long-run diversion trends. These

6 equations are updated quarterly and a set of these equations are filed with the Postal

7 Regulatory Commission annually. The most recent set of demand equations were filed

8 with the PRC on January 20, 2021.

9 The equations filed with the PRC on January 20, 2021 served as the starting point

10 for the analysis presented in this case. In order to estimate the impact of Postal Service

11 standards on First-Class Mail and Periodicals Mail volumes, a measure of delivery

12 performance was added to these demand equations.

13 The delivery performance measure chosen for this analysis was average days to

14 delivery. The Postal Service tracks average days to delivery by quarter for First-Class

15 Mail as well as for Periodicals Mail. This makes such a series amenable to inclusion

16 within the Postal Service's econometric demand equations, which are estimated based

17 on quarterly data.

B. First-Class Mail
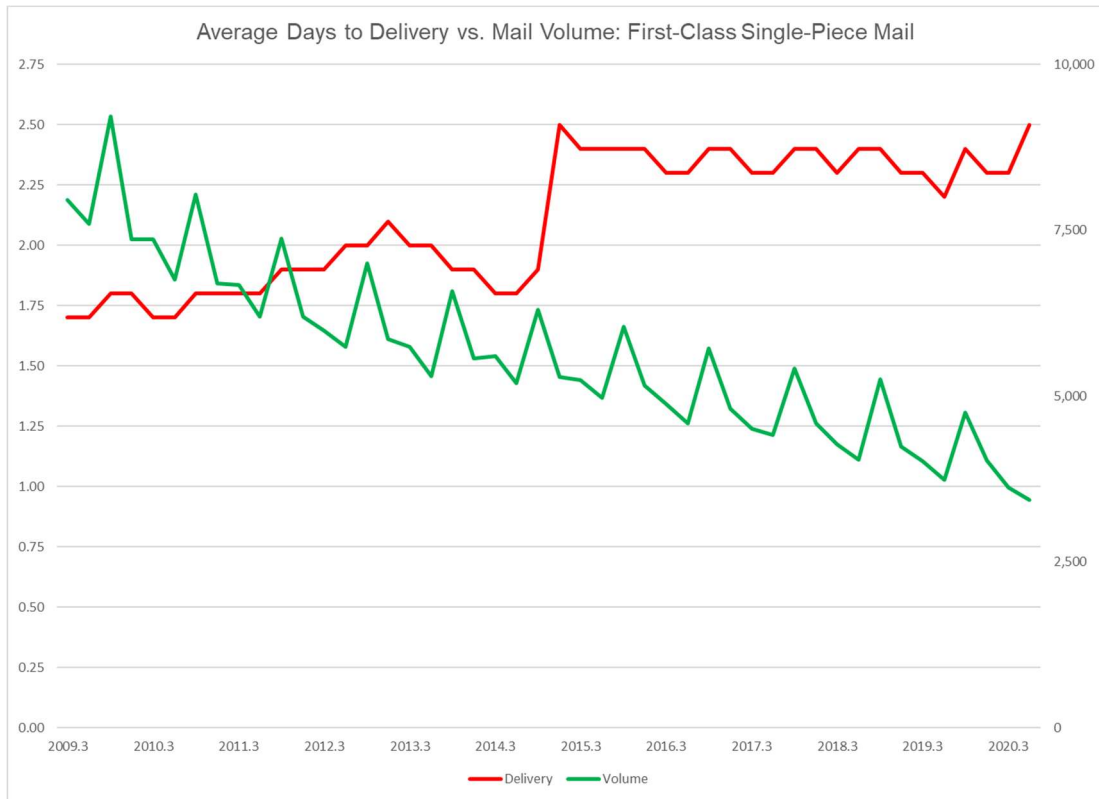
1. Historical Changes in Average Days to Delivery

For my analysis, average days to delivery for First-Class Mail was available by Postal quarter dating back to 2009Q3 and for selected quarters prior to that. Based on the data available, average days to delivery appear to have been relatively constant in the years preceding 2009 and were treated as such in my analysis.

The first chart below compares First-Class Single-Piece Letters, Cards, and Flats volume (hereafter "First-Class Single-Piece Mail") and average days to delivery for First-Class Single-Piece Mail from 2009Q3 through 2020Q4. The second chart compares year-over-year changes in the two variables.

There is not an obvious visual relationship between these two data series. First-Class Single-Piece Mail volume declined over the time period shown and average days to delivery increased. But while the volume decline was fairly uniform, as indicated by the relatively flat green line in the second graph, the increase in average days to delivery was concentrated primarily in 2015.[1]

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[1] The United States Postal Service began implementing the second phase of the Network Rationalization Plan in January 2015. Revised Service Standards for Market-Dominant Mail Products; Designation of Implementation Date, 79 FR 44700 (Aug. 1, 2014).

1

Average Days to Delivery vs. Mail Volume: First-Class Single-Piece Mail

2.75 — 10,000
2.50
2.25
2.00
1.75
1.50
1.25
1.00
0.75
0.50
0.25
0.00 — 0

2009.3 2010.3 2011.3 2012.3 2013.3 2014.3 2015.3 2016.3 2017.3 2018.3 2019.3 2020.3

—— Delivery —— Volume

2
3

Average Days to Delivery vs. Mail Volume: First-Class Single-Piece Mail
% Change over Same Period Last Year (SPLY)

40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
-5.0%
-10.0%
-15.0%
-20.0%

2010.3 2011.3 2012.3 2013.3 2014.3 2015.3 2016.3 2017.3 2018.3 2019.3 2020.3

—— Delivery SPLY —— Volume SPLY

4
5

1   The next chart compares First-Class Workshare Mail volume and average days to

2   delivery for First-Class Workshare Mail from 2009Q3 through 2020Q4. The second

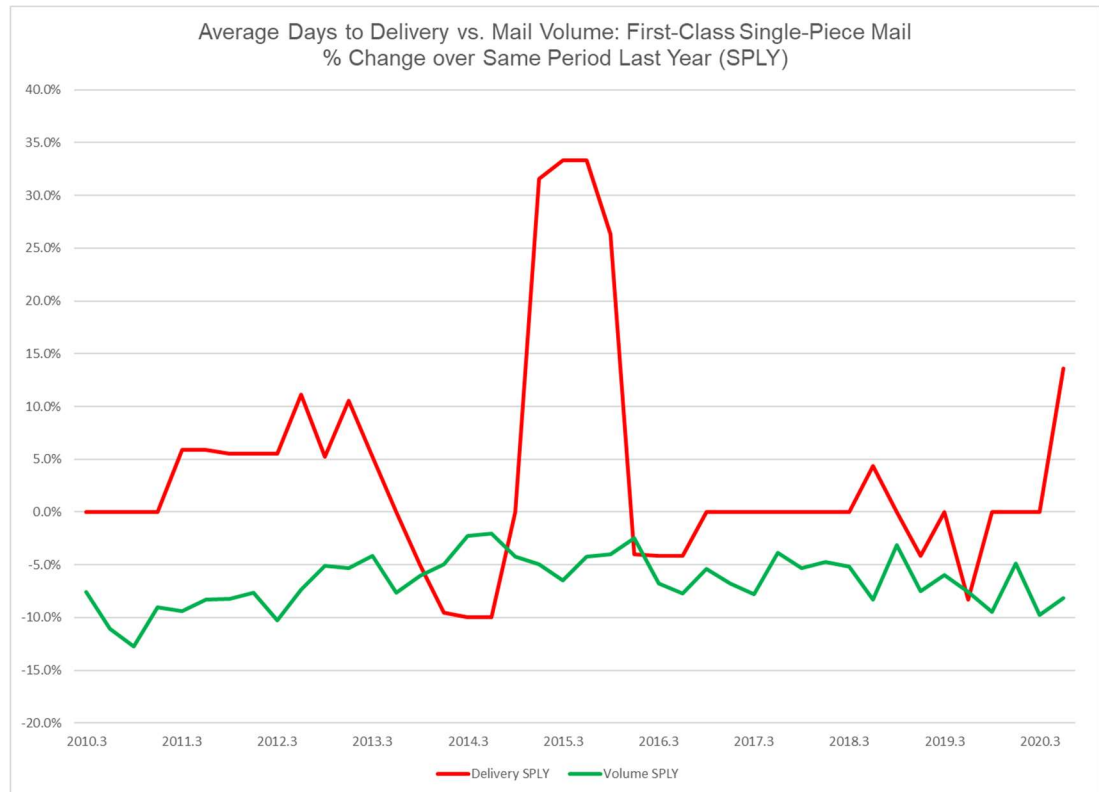3   chart compares year-over-year changes in the two variables.

4   The story is similar to that for First-Class Single-Piece Mail: there is no obvious

5   correlation between the two series. One way in which the two stories differ, however, is

6   that average days to delivery for First-Class Workshare Mail were not materially

7   different in 2019 than they were in 2010. In the case of First-Class Workshare Mail, the

8   impact of the last change in service standards appears to have been temporary.

1

Average Days to Delivery vs. Mail Volume: First-Class Workshare Mail

2

Average Days to Delivery vs. Mail Volume: First-Class Workshare Mail
% Change over Same Period Last Year (SPLY)

3
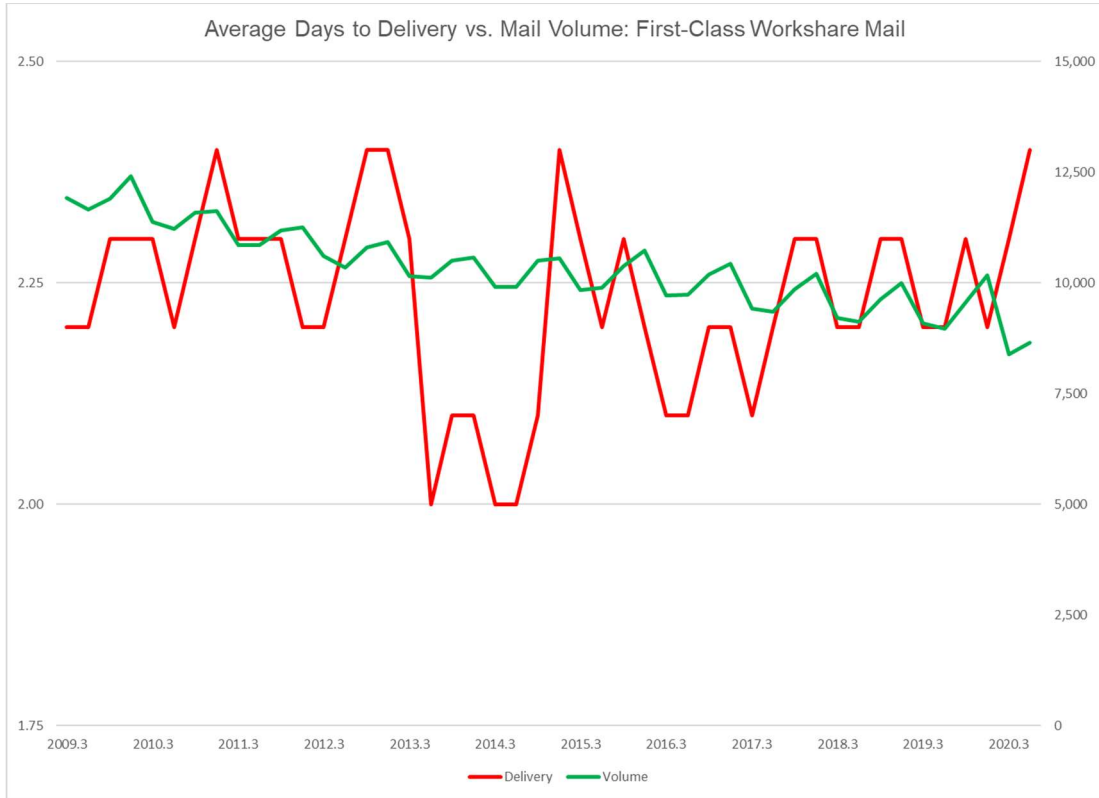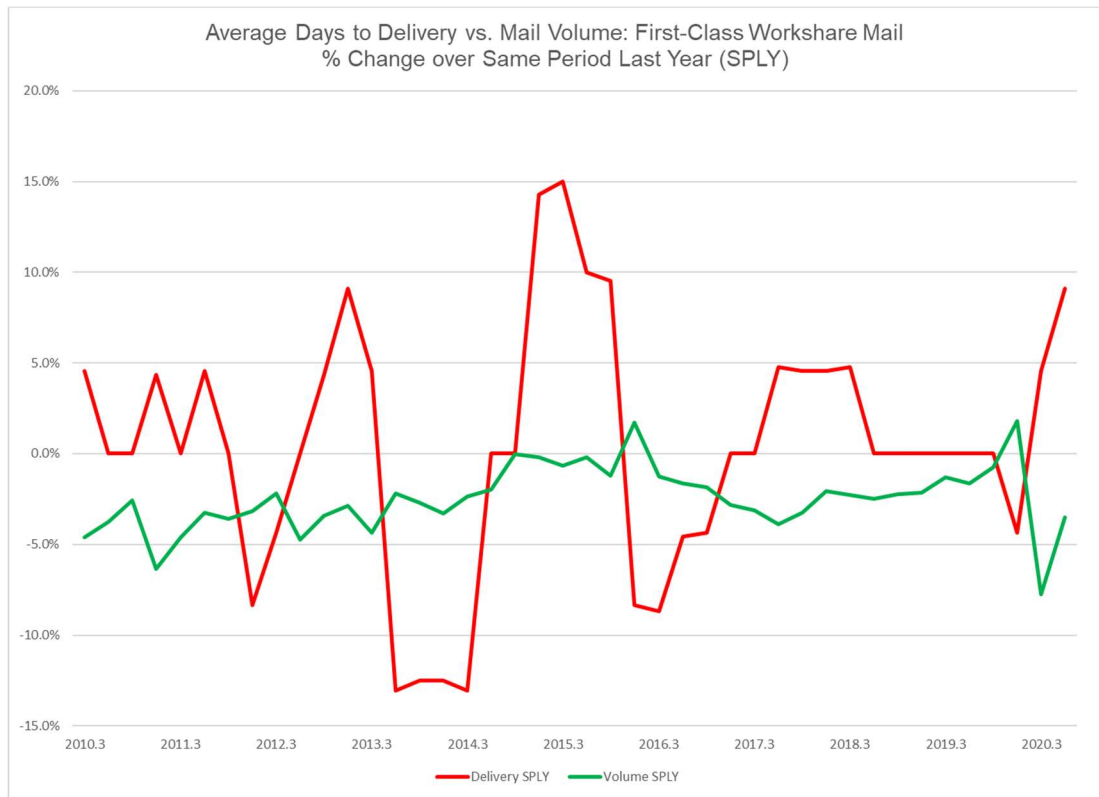
1   **2. Econometric Results**

2   The Postal Service decomposes First-Class Mail across two dimensions for the

3   purpose of estimating econometric demand equations: Single-Piece versus Workshare

4   (or Presort) and by shape three ways – Letters, Cards, and Flats. Hence, there are six

5   relevant equations[2].

6   The functional form of the Postal Service's econometric equations is "log-log" such

7   that the dependent variable in the equation is the natural log of mail volume and most of

8   the explanatory variables are also constructed by taking the natural log of the variable of

9   interest. The resulting coefficients from a log-log equation can be interpreted as

10   "elasticities." An elasticity of e with respect to variable x indicates that a 1% increase in

11   the value of x would lead to an e% change in volume.

12   Average days to delivery, d, was added as a possible variable in each of the six

13   relevant First-Class Mail equations. The expected sign of the coefficient on d would be

14   negative – longer delivery times would be expected to reduce volume, all other things

15   being equal. For the three single-piece equations, average days to delivery for First-

16   Class Single-Piece Mail was tested as well as average days to delivery for total First-

17   Class Mail. For the three workshared equations, average days to delivery for First-Class

18   Workshare Mail was tested as well as average days to delivery for total First-Class Mail.

19   In all cases, the more specific data series produced more significant results – i.e.,

20   average days to delivery for First-Class Single-Piece Mail in the First-Class Single-

21   Piece equations and average days to delivery for First-Class Workshare Mail in the

22   First-Class Workshare equations.

23   Average days to delivery was tested at various lags up to four quarters (i.e., one

24   year). Lags were tested together (as, for example, price is currently included in most of

---

[2] Separate equations are estimated for First-Class Single-Piece Stamped Letters and First-Class Single-Piece Metered Letters. These equations are estimated over a fairly short sample period, however (starting in FY 2014) with some restrictions imposed from an equation for total First-Class Single-Piece Letters which is estimated over a longer sample period. This latter equation is the equation which was analyzed for this case.

1   the equations) as well as individually. Generally speaking, the results tended to be more

2   robust when only a single lag was included. The optimal lag turned out to be either three

3   or four quarters for all six equations tested suggesting that it takes mailers perhaps 9 to

4   12 months to react to changes in average days to delivery. The estimated financial

5   impacts presented in Section III of this testimony are based on long-run impacts after

6   allowing time for whatever lag might be appropriate.

7   The best econometric results including average days to delivery are presented in the

8   tables on the next six pages. For this analysis, "best" was defined as the equation for

9   which the coefficient on average days to delivery had the expected sign (negative)

10   which produced the lowest mean-squared error and the highest t-statistic on the

11   delivery coefficient.

12   The first column of each table presents the Postal Service's baseline econometric

13   equation (which was filed with the PRC on January 20, 2021). The second column then

14   adds average days to delivery at the lag which was found to produce the strongest

15   econometric results.

1   First-Class Single-Piece Letters

2   The demand equation for First-Class Single-Piece Letters is estimated over a

3   sample period of 2004PQ1 – 2020PQ4 and includes the following explanatory variables:

4

5   •   Own-price elasticity lagged zero through four quarters

6   •   Employment, current only

7   •   Linear time trends starting in 2004PQ1 (full-sample) and 2016PQ3

8   •   Non-linear intervention variable beginning in 2008PQ4

9   •   Various dummy variables, including seasonal variables and
10   dummies equal to one in 2020PQ3 and 2020PQ4

11

12

First-Class Single-Piece Letters

	Baseline	Avg. Delivery Added
Own-Price Elasticity	-0.148 (-1.297)	-0.173 (-1.731)
Average Days to Delivery – lag 3	-	**-0.101 (-2.882)**
Employment	0.732 (6.464)	0.833 (8.314)

Time Trends
  Full-Sample
  Starting in 2016PQ3
	
	-0.0151 (-26.09)
	-0.0042 (-4.322)
		
		-0.0145 (-26.45)
		-0.0042 (-4.867)

Mean-Squared Error	0.000216	0.000186

13

14   Numbers in parentheses are t-statistics. A t-statistic greater than two in absolute

15   value is generally regarded as statistically significant. The t-statistic on average delivery

16   time is -2.88 which is statistically significant. The inclusion of average delivery improves

17   the mean-squared error of the equation (lower numbers are better) by approximately 14

18   percent.

19   Average days to delivery for First-Class Single-Piece Mail has ranged from 1.7 days

20   to 2.5 days over the sample period used here. The coefficient on average delivery time,

21   −0.101, would translate into a volume decline of approximately 3.8 percent based on a

22   change in average days to delivery from 1.7 days to 2.5 days.

1   First-Class Single-Piece Cards

2   The demand equation for First-Class Single-Piece Cards is estimated over a sample

3   period of 2004PQ1 – 2020PQ4 and includes the following explanatory variables:

4

5   •   Own-price elasticity lagged zero through one quarter

6   •   Employment, current only

7   •   Linear time trends starting in 2004PQ1 (full-sample) and 2010PQ2

8   •   Various dummy variables, including seasonal variables and a
9   dummy equal to one in 2020PQ4

10
11
First-Class Single-Piece Cards

	Baseline	Avg. Delivery Added
Own-Price Elasticity	-0.373 (-3.406)	-0.364 (-3.297)
Average Days to Delivery – lag 4	-	**-0.060 (-0.882)**
Employment	0.886 (6.917)	0.918 (6.882)
Time Trends		
Full-Sample	-0.0194 (-13.22)	-0.0194 (-13.14)
Starting in 2010PQ2	-0.0095 (-5.685)	-0.0092 (-5.327)
Mean-Squared Error	0.000735	0.000738

12

13   Numbers in parentheses are t-statistics. A t-statistic greater than two in absolute

14   value is generally regarded as statistically significant. The t-statistic on average delivery

15   time is -0.88 which is not statistically significant, meaning the coefficient is not

16   significantly different than zero (which would suggest that changes in delivery time had

17   no impact on mail volume). In fact, this equation, with a four-quarter lag of average

18   delivery time, was the only equation tested for which the coefficient on average delivery

19   time was negative. That said, the estimated coefficient on average delivery time, -0.060,

20   is broadly consistent with the coefficient on average days to delivery in the other

21   equations presented here, most of which have a value of approximately -0.1.

22   Average days to delivery for First-Class Single-Piece Mail has ranged from 1.7 days

23   to 2.5 days over the sample period used here. The coefficient on average delivery time,

1   −0.060, would translate into a volume decline of approximately 2.3 percent based on a

2   change in average days to delivery from 1.7 days to 2.5 days.

3

4   <u>First-Class Single-Piece Flats</u>

5   The demand equation for First-Class Single-Piece Flats is estimated over a sample

6   period of 2004PQ1 – 2020PQ4 and includes the following explanatory variables:

7

8   • Own-price elasticity with zero through three quarters

9   • Employment

10   • Full-sample linear time trend

11   • Non-linear intervention variable starting in 2008PQ4

12   • Various dummy variables, including seasonal variables

13

14
First-Class Single-Piece Flats

	Baseline	Avg. Delivery Added
Own-Price Elasticity	-0.248 (-1.584)	-0.199 (-1.286)
Average Days to Delivery– lag 3	-	**-0.093 (-2.094)**
Employment	0.374 (3.355)	0.420 (3.638)
Time Trends Full-Sample	-0.0161 (-12.35)	-0.0160 (-12.59)
Mean-Squared Error	0.000331	0.000319

15

16   Numbers in parentheses are t-statistics. A t-statistic greater than two in absolute

17   value is generally regarded as statistically significant. The t-statistic on average delivery

18   time is significant and -2.09. The inclusion of average delivery improves the mean-

19   squared error of the equation (lower numbers are better) by approximately 4 percent.

20   The estimated coefficient on average delivery time here, -0.093, is quite similar to

21   the results for First-Class Single-Piece Letters (-0.101) and Cards (-0.060), suggesting

22   that the impact of delivery time on First-Class Single-Piece Mail is broadly consistent

23   across shapes.

1   Average days to delivery for First-Class Single-Piece Mail has ranged from 1.7 days

2   to 2.5 days over the sample period used here. The coefficient on average delivery time,

3   −0.093, would translate into a volume decline of approximately 3.5 percent based on a

4   change in average days to delivery from 1.7 days to 2.5 days.

5

6   <u>First-Class Workshare Letters</u>

7   The demand equation for First-Class Workshare Letters is estimated over a sample

8   period of 2004PQ1 – 2020PQ4 and includes the following explanatory variables:

9

10   •   Own-Price lagged zero through four quarters

11   •   Employment

12   •   Non-linear intervention variables beginning in 2008PQ1 and
13   2016PQ3

14   •   Time trend starting in 2007PQ3

15   •   Several dummy variables, including a Federal election variable and
16   seasonal dummies

17

18   Census mailings volumes were removed from the dependent variables used to

19   estimate the equations presented here.

20
21

First-Class Workshare Letters		
	Baseline	Avg. Delivery Added
Own-Price Elasticity	-0.231 (-2.017)	-0.255 (-2.155)
Average Days to Delivery– lag 4	**-**	**-0.031 (-0.824)**
Employment	0.629 (15.98)	0.634 (15.82)
Time Trends Starting in 2007PQ3	-0.0037 (-1.918)	-0.0041 (-2.529)
Mean-Squared Error	0.000097	0.000098

22

23   Numbers in parentheses are t-statistics. A t-statistic greater than two in absolute

24   value is generally regarded as statistically significant. The t-statistic on average delivery

25   time is -0.82 which is not statistically significant.

1   Because the coefficient estimate here is not statistically significant, a 95 percent

2   confidence interval around this coefficient estimate would include zero – i.e., that First-

3   Class Workshare Mail volume would be unaffected by changes in average delivery time.

4   The upper limit of such a confidence interval would be -0.106 which is extremely similar

5   to the result found above for First-Class Single-Piece Letters (-0.101). Overall, the

6   evidence here strongly suggests that First-Class Workshare Mail volume is less

7   sensitive to changes in delivery times than First-Class Single-Piece volume.

8   Average days to delivery for First-Class Presort Mail has ranged from 2.0 days to 2.4

9   days over the sample period used here. The coefficient on average delivery time,

10   -0.031, would translate into a volume decline of approximately 0.6 percent based on a

11   change in average days to delivery from 2.0 to 2.4.

12

13   <u>First-Class Workshare Cards</u>

14   The demand equation for First-Class Workshare Cards is estimated over a sample

15   period of 2004PQ1 – 2020PQ4 and includes the following explanatory variables.

16

17   - Own-price, lagged zero through one quarter

18   - Employment

19   - Full sample linear time trend, and two additional linear time trends
20   starting in 2008PQ1 and 2014PQ1

21   - Several dummy variables, including seasonal dummy variables as
22   well as a dummy equal to one in 2020PQ4

23

24   Census mailings volumes were removed from the dependent variables used to

25   estimate the equations presented here.

26

First-Class Workshare Cards

	Baseline	Avg. Delivery Added
Own-Price Elasticity	-0.413 (-1.981)	-0.485 (-2.223)
Average Days to Delivery – lag 4	-	**-0.160 (-1.096)**
Employment	1.086 (5.520)	1.095 (5.568)
Time Trend		
Full-Sample	0.0137 (7.862)	0.0139 (7.940)
Starting in 2008PQ1	-0.0304 (-10.78)	-0.0305 (-10.83)
Starting in 2014PQ1	0.0026 (1.100)	0.0025 (1.024)
Mean-Squared Error	0.001647	0.001641

Numbers in parentheses are t-statistics. A t-statistic greater than two in absolute

value is generally regarded as statistically significant. The t-statistic on average delivery

time is -1.1 which is not statistically significant (i.e., is not significantly different from

zero). The inclusion of average delivery does, however, improve the mean-squared

error of the equation (lower numbers are better) very slightly.

Average days to delivery for First-Class Presort Mail has ranged from 2.0 days to 2.4

days over the sample period used here. The coefficient on average delivery time,

−0.160, would translate into a volume decline of approximately 2.9 percent based on a

change in average days to delivery from 2.0 days to 2.4 days.

First-Class Workshare Flats

The demand equation for First-Class Workshare Flats is estimated over a sample

period of 2004PQ1 – 2020PQ4 and includes the following explanatory variables.

- Own-price lagged zero through two quarters

- Employment

- Two linear time trends starting in 2008PQ1 and 2017PQ2

- Several dummy variables, including seasonal dummy variables and a dummy for 2020PQ4

First-Class Workshare Flats

	Baseline	Avg. Delivery Added
Own-Price Elasticity	-0.319 (-1.348)	-0.374 (-1.500)
Average Days to Delivery – lag 3	-	**-0.101 (-0.591)**
Employment	1.122 (5.317)	1.153 (5.331)
Time Trend		
Starting in 2008PQ1	-0.0096 (-8.966)	-0.0096 (-8.602)
Starting in 2017PQ2	-0.0058 (-1.139)	-0.0062 (-1.209)
Mean-Squared Error	0.002241	0.002262

Numbers in parentheses are t-statistics. A t-statistic greater than two in absolute value is generally regarded as statistically significant. The t-statistic on average delivery time is -0.59 which, as in the case of First-Class Workshare Cards, is not significantly different than zero.

Average days to delivery for First-Class Presort Mail has ranged from 2.0 days to 2.4 days over the sample period used here. The coefficient on average delivery time, −0.101, would translate into a volume decline of approximately 1.8 percent based on a change in average days to delivery from 2.0 days to 2.4 days.

1   **3. Sources of Change**

2   In past presentations to the PRC, I have presented "Sources-of-Change" tables

3   which decompose historical (and forecast) volumes into the factors which drive volume.

4   Such tables served, for example, as the centerpiece of my testimony in Docket No.

5   R2013-11 where they were used to quantify the impact of the Great Recession on mail

6   volumes.

7   Sources of change tables are constructed as follows:

8   The calculation of the estimated impacts on mail volume begins with the calculation

9   of quarterly projection factors of the form, $[x_{it} / x_{i(t-1)}]^{e_i}$, (as described, for example, in my

10   R2006-1 testimony at page 333). The process by which I convert from quarterly

11   percentages to annual percentages is a two-step process. First, the quarterly

12   percentage impact of each factor is converted into a number of pieces. The quarterly

13   impacts are then aggregated to express annual impacts of each factor, expressed as a

14   number of pieces.

15   In converting percentages to pieces, order matters – i.e., if I multiply each

16   percentage times the starting volume, I get a different answer than if I multiply each

17   percentage times the ending volume, and in neither of these cases, if I then sum up the

18   pieces, do I get the same answer as if I sum up the percentages[3]. In this case, I

19   converted from percentages to pieces sequentially. That is, suppose there are three

20   factors; x, y, and z; contributing to changes in volume. Then,

21
22   Ending Volume = Starting Volume • (1+x) • (1+y) • (1+z)
23
24   First, x is converted to pieces (P_x) by multiplying Starting Volume times x. Next, y is

25   converted to pieces (P_y) by multiplying [Starting Volume + P_x] times y. Finally, z is

26   converted to pieces (P_z) by multiplying [Starting Volume + P_x + P_y] times z.

---

[3] Percentages are multiplicative, not additive. Whenever I use the phrase "sum [or add] up the percentages" I mean, for percentages a, b, and c, calculate (1+a)•(1+b)•(1+c) - 1.

1   This leads to the result that

2   Ending Volume = Starting Volume + P_x + P_y + P_z
3
4   In this case, however, the values for P_x, P_y, and P_z depend on the order in which

5   they are calculated. For consistency, I use a standard order in which explanatory

6   variables are analyzed for all mail categories: population, macroeconomic variables,

7   time trends, Internet variables, input prices, Postal prices (nominal), competitor prices,

8   inflation, other econometric factors, seasonality, and unexplained factors. As a practical

9   matter, the effect of order on the results is fairly trivial and does not affect the general

10   conclusions of my analysis. Average days to delivery is treated as an "other

11   econometric factor" within this ordering.

12   After converting from quarterly percentages to quarterly pieces, then, quarterly

13   pieces are converted into annual pieces. This is done by summing the quarter-by-

14   quarter impacts of moving from Quarters 1 through 4 to Quarters 5 through 8 as follows.

15   The impact of a factor between Quarter 1 and Quarter 5 is equal to the impact from

16   Quarter 1 to Quarter 2 plus the impact from Quarter 2 to Quarter 3 plus the impact from

17   Quarter 3 to Quarter 4 plus the impact from Quarter 4 to Quarter 5. Looking at the

18   impact from Quarters 2 through 4 to Quarters 6 through 8 in the same way yields the

19   following overall formula:

20
21   Change from (Quarters 1 through 4) to (Quarters 5 through 8) =
22   Change (Q1 to Q2) + 2·Change (Q2 to Q3) + 3·Change (Q3 to Q4) + 4·Change (Q4 to Q5) +
23   3·Change (Q5 to Q6) + 2·Change (Q6 to Q7) + Change (Q7 to Q8)

1   Sources of change tables were constructed in this way for each of the six First-Class

2   Mail equations to which average days to delivery were added in Section II.B. above.

3   Results for First-Class Single-Piece and Workshare Mail are shown on the next

4   page. A table which aggregates the results for all First-Class Mail follows that.

5   For most years, changes in average delivery time have been a much smaller factor

6   affecting First-Class Mail volume growth than other factors. This is due largely to the

7   fact that average days to delivery have been relatively stable over this time period

8   outside of changes to service standards implemented by the Postal Service in FY 2011

9   and FY 2015. Even in the years which saw these changes, however, the impact of

10   delivery time was significantly less than the impact of ongoing long-run diversion trends.

Sources of Change in Mail Volumes since 2010, Changes expressed in Changes in Total Volume

	Starting Volume	Population	Diversion Trends	Macro-Economy	Postal Prices	Inflation	Avg. Delivery Time	Other Factors	Final Volume
First-Class Single-Piece Mail									
2011	30,695.7	316.3	(1,927.4)	200.5	(21.3)	113.1	**(14.6)**	(1,751.8)	27,610.5
2012	27,610.5	304.9	(1,729.0)	251.0	(101.6)	134.2	**(96.4)**	(1,072.7)	25,301.0
2013	25,301.0	283.8	(1,584.7)	173.2	(113.5)	75.7	**(152.5)**	(73.0)	23,909.8
2014	23,909.8	260.0	(1,478.4)	192.4	(155.5)	65.1	**(38.1)**	199.6	22,954.8
2015	22,954.8	240.5	(1,408.0)	231.7	(120.1)	27.2	**188.5**	(301.0)	21,813.7
2016	21,813.7	220.6	(1,389.5)	169.6	17.8	24.7	**(499.0)**	329.7	20,687.5
2017	20,687.5	189.9	(1,524.0)	134.4	62.6	65.5	**73.8**	(234.6)	19,455.2
2018	19,455.2	157.5	(1,454.2)	140.8	(68.1)	76.6	**17.5**	(1.7)	18,323.6
2019	18,323.6	137.0	(1,367.0)	115.6	(137.6)	64.1	**(0.5)**	116.6	17,251.8
2020	17,251.8	127.8	(1,265.2)	(653.9)	(94.4)	46.5	**47.9**	390.6	15,851.1
Total	30,695.7	2,238.2	(15,127.3)	955.3	(731.9)	692.7	**(473.4)**	(2,398.2)	15,851.1
First-Class Workshare Mail									
2011	46,895.9	498.7	(2,511.4)	134.6	(96.1)	278.6	**(33.7)**	(255.3)	44,911.4
2012	44,911.4	508.2	(2,446.1)	310.1	(272.0)	316.2	**(37.0)**	86.4	43,377.2
2013	43,377.2	493.3	(1,776.8)	233.8	(262.2)	207.0	**57.3**	(106.6)	42,222.9
2014	42,222.9	464.9	(1,194.3)	284.1	(447.9)	176.6	**(10.6)**	(376.5)	41,119.1
2015	41,119.1	439.8	(916.2)	350.3	(385.6)	85.5	**161.7**	107.0	40,961.7
2016	40,961.7	421.8	(1,149.4)	266.5	(71.7)	78.3	**(147.2)**	335.8	40,695.7
2017	40,695.7	381.1	(1,912.0)	219.3	238.4	192.1	**57.4**	(380.8)	39,491.1
2018	39,491.1	324.8	(1,877.8)	234.6	(5.9)	239.0	**6.7**	63.0	38,475.5
2019	38,475.5	293.4	(1,280.8)	199.9	(100.2)	211.3	**(41.8)**	(5.0)	37,752.1
2020	37,752.1	289.9	(874.1)	(1,420.9)	(117.5)	159.4	**4.7**	1,030.2	36,823.8
Total	46,895.9	4,115.7	(15,938.9)	812.2	(1,520.6)	1,943.9	**17.4**	498.3	36,823.8

Sources of Change in Mail Volumes since 2010, Changes expressed in Changes in Total Volume

	Starting Volume	Population	Diversion Trends	Macro-Economy	Postal Prices	Inflation	**Avg. Delivery Time**	Other Factors	Final Volume
First-Class Mail									
2011	77,591.6	815.0	(4,438.7)	335.0	(117.4)	391.7	**(48.3)**	(2,007.1)	72,521.9
2012	72,521.9	813.0	(4,175.2)	561.2	(373.6)	450.5	**(133.4)**	(986.3)	68,678.1
2013	68,678.1	777.1	(3,361.5)	406.9	(375.7)	282.6	**(95.2)**	(179.6)	66,132.8
2014	66,132.8	724.8	(2,672.7)	476.5	(603.4)	241.7	**(48.7)**	(176.9)	64,074.0
2015	64,074.0	680.3	(2,324.1)	582.0	(505.8)	112.6	**350.3**	(194.0)	62,775.4
2016	62,775.4	642.3	(2,538.9)	436.1	(53.9)	102.9	**(646.3)**	665.5	61,383.2
2017	61,383.2	571.0	(3,435.9)	353.7	301.0	257.6	**131.1**	(615.3)	58,946.3
2018	58,946.3	482.3	(3,332.0)	375.4	(74.0)	315.6	**24.2**	61.3	56,799.1
2019	56,799.1	430.4	(2,647.8)	315.5	(237.8)	275.3	**(42.3)**	111.6	55,003.9
2020	55,003.9	417.7	(2,139.3)	(2,074.8)	(211.9)	205.9	**52.6**	1,420.9	52,674.9
Total	77,591.6	6,353.9	(31,066.2)	1,767.5	(2,252.5)	2,636.5	**(456.0)**	(1,899.9)	52,674.9

1

1   **4. Household Diary Study Analysis**

2   As a potential extension of the econometric results presented above, an analysis

3 was undertaken of Household Diary Study data which decomposed mail by its primary

4 use.[4] Formal econometric analysis of these data was not undertaken but a visual

5 analysis of the result is nevertheless interesting.

6   First-Class Mail was decomposed into seven categories based on the content of the

7 mail. Annual volumes are shown in the first table below followed by a table showing

8 year-over-year changes. Average days to delivery are also shown for both tables.

---

[4] The Household Diary Study reports mail sent or received by households and therefore does not include mail sent between non-households. However, household sent or received mail is the vast majority of First-Class Mail.

First-Class Mail volumes vs. Average Delivery Time, by Type of Mail: 2005 - 2020 (annual)

| | **First-Class Mail** | | | | | | | | |
| | Sent by Households (HDS) | | Non-Household to Household (HDS) | | | | | | Avg. Delivery |
	Correspondence	Bill Payments	Correspondence	Advertising	Bills	Statements	Other	Total (RPW)	Days
2005	7,989.3	8,970.2	19,223.3	10,782.3	17,872.2	6,272.2	26,466.3	97,575.8	2.02
2006	8,265.6	8,733.5	18,494.9	10,344.4	18,335.5	6,642.5	26,119.2	96,935.7	2.03
2007	7,943.8	8,365.2	18,820.6	9,033.8	18,202.0	6,809.3	26,168.8	95,343.6	2.09
2008	7,729.4	6,995.2	18,087.3	8,257.3	17,978.3	6,293.7	25,330.0	90,671.2	2.13
2009	7,135.8	6,493.9	16,795.5	6,648.5	17,116.5	6,386.5	22,150.3	82,727.0	2.02
2010	5,590.8	5,632.3	15,994.6	6,115.1	15,365.2	5,417.8	23,475.8	77,591.6	2.07
2011	4,964.9	5,516.9	16,280.9	5,447.8	15,180.6	4,655.1	20,475.7	72,521.9	2.13
2012	5,009.2	5,097.9	16,311.4	5,021.3	14,847.0	4,744.5	17,642.4	68,673.7	2.13
2013	4,916.0	4,513.0	15,497.2	4,240.1	14,268.8	4,284.9	18,171.7	65,891.7	2.18
2014	4,403.4	4,470.0	15,407.8	3,924.8	14,102.8	4,513.9	17,026.4	63,849.0	1.98
2015	4,607.4	4,382.6	15,003.7	3,593.4	13,842.1	4,204.1	16,965.5	62,598.8	2.27
2016	4,046.8	3,752.8	15,143.6	3,826.0	13,594.6	3,994.0	16,881.3	61,239.1	2.23
2017	3,554.7	3,341.4	15,014.6	3,712.2	12,629.7	4,050.9	16,529.7	58,833.3	2.23
2018	3,440.8	3,100.2	14,774.6	3,504.0	12,526.0	3,930.7	15,435.3	56,711.6	2.29
2019	3,319.1	2,784.0	14,102.5	3,972.8	11,367.5	3,741.4	15,649.4	54,936.7	2.27
2020	3,133.6	2,467.2	13,621.5	3,470.2	10,593.6	3,870.6	15,466.1	52,622.8	2.32
SPLYs									
2006	3.5%	-2.6%	-3.8%	-4.1%	2.6%	5.9%	-1.3%	-0.7%	0.4%
2007	-3.9%	-4.2%	1.8%	-12.7%	-0.7%	2.5%	0.2%	-1.6%	2.9%
2008	-2.7%	-16.4%	-3.9%	-8.6%	-1.2%	-7.6%	-3.2%	-4.9%	1.8%
2009	-7.7%	-7.2%	-7.1%	-19.5%	-4.8%	1.5%	-12.6%	-8.8%	-5.0%
2010	-21.7%	-13.3%	-4.8%	-8.0%	-10.2%	-15.2%	6.0%	-6.2%	2.4%
2011	-11.2%	-2.0%	1.8%	-10.9%	-1.2%	-14.1%	-12.8%	-6.5%	2.8%
2012	0.9%	-7.6%	0.2%	-7.8%	-2.2%	1.9%	-13.8%	-5.3%	0.2%
2013	-1.9%	-11.5%	-5.0%	-15.6%	-3.9%	-9.7%	3.0%	-4.1%	2.5%
2014	-10.4%	-1.0%	-0.6%	-7.4%	-1.2%	5.3%	-6.3%	-3.1%	-9.4%
2015	4.6%	-2.0%	-2.6%	-8.4%	-1.8%	-6.9%	-0.4%	-2.0%	14.6%
2016	-12.2%	-14.4%	0.9%	6.5%	-1.8%	-5.0%	-0.5%	-2.2%	-1.5%
2017	-12.2%	-11.0%	-0.9%	-3.0%	-7.1%	1.4%	-2.1%	-3.9%	-0.1%
2018	-3.2%	-7.2%	-1.6%	-5.6%	-0.8%	-3.0%	-6.6%	-3.6%	2.6%
2019	-3.5%	-10.2%	-4.5%	13.4%	-9.2%	-4.8%	1.4%	-3.1%	-1.1%
2020	-5.6%	-11.4%	-3.4%	-12.7%	-6.8%	3.5%	-1.2%	-4.2%	2.5%

1

1   Generally speaking, First-Class Mail volume has been declining consistently across

2   all categories. Comparing year-over-year volume changes with year-over-year changes

3   in average days to delivery (keeping in mind the econometric result suggesting that

4   volume reacts to delivery with a lag of up to one year), the clearest correlation between

5   the two is in the first two columns: mail volume sent by households. The large increase

6   in average days to delivery in 2015 (+14.6%) is followed by fairly large decreases in

7   volume sent by households in 2016 (-13.2%) and 2017 (-11.6%). The only larger year-

8   over-year change in volume sent by households was 2010 when such volume declined

9   by 17.7 percent in the wake of the Great Recession.

10   Among the categories of mail sent by non-households, on the other hand, the results

11   in 2015, 2016, and 2017 are unremarkable. The results here could suggest that

12   households are more likely to reduce mail volumes in response to longer delivery times.

13   First-Class Mail sent by households is all Single-Piece while mail sent by non-

14   households is a mix of Single-Piece and Workshare Mail. The result here that

15   households are more sensitive than non-households to changes in average days to

16   delivery is consistent with the econometric results presented earlier which found a

17   somewhat stronger impact of average days to delivery on First-Class Single-Piece Mail

18   volume than for First-Class Workshare Mail.

1   **C. Periodicals Mail**

2   **1. Historical Changes in Average Days to Delivery**

3   The Postal Service's proposals in this case are expected to affect the average

4   delivery time for some end-to-end Periodicals Mail. Overall, it is estimated that

5   approximately one-third of total Periodicals Mail are end-to-end. It was estimated,

6   however, that only 7 percent of Periodicals Mail will be affected by the Postal Service's

7   proposals in this case.

8   Separate estimates for average delivery time were obtained for total Periodicals Mail

9   as well as for end-to-end Periodicals. Both of these measures were tested as possible

10   explanatory variables in the Periodicals Regular Rate demand equation (separately).

11   The results were uniformly better using average days to delivery for all Periodicals Mail

12   rather than only end-to-end Periodicals Mail.

13   For my analysis, average delivery time for Periodicals Mail was only available dating

14   back to 2014Q1.

15   The first chart below compares total Periodicals Mail volume and average days to

16   delivery for total Periodicals Mail from 2014Q1 through 2020Q4. The second chart

17   compares year-over-year changes in the two variables.

Average Days to Delivery vs. Mail Volume: Periodicals Mail

1

Average Days to Delivery vs. Mail Volume: Periodicals Mail
% Change over Same Period Last Year (SPLY)
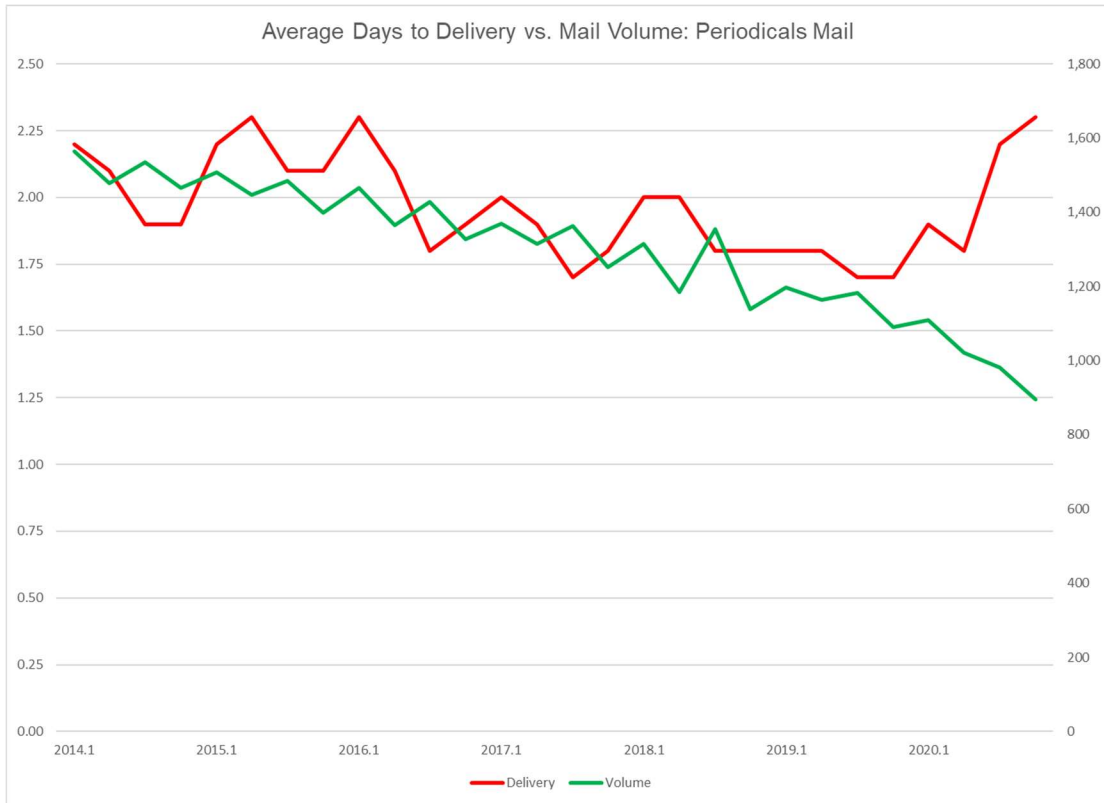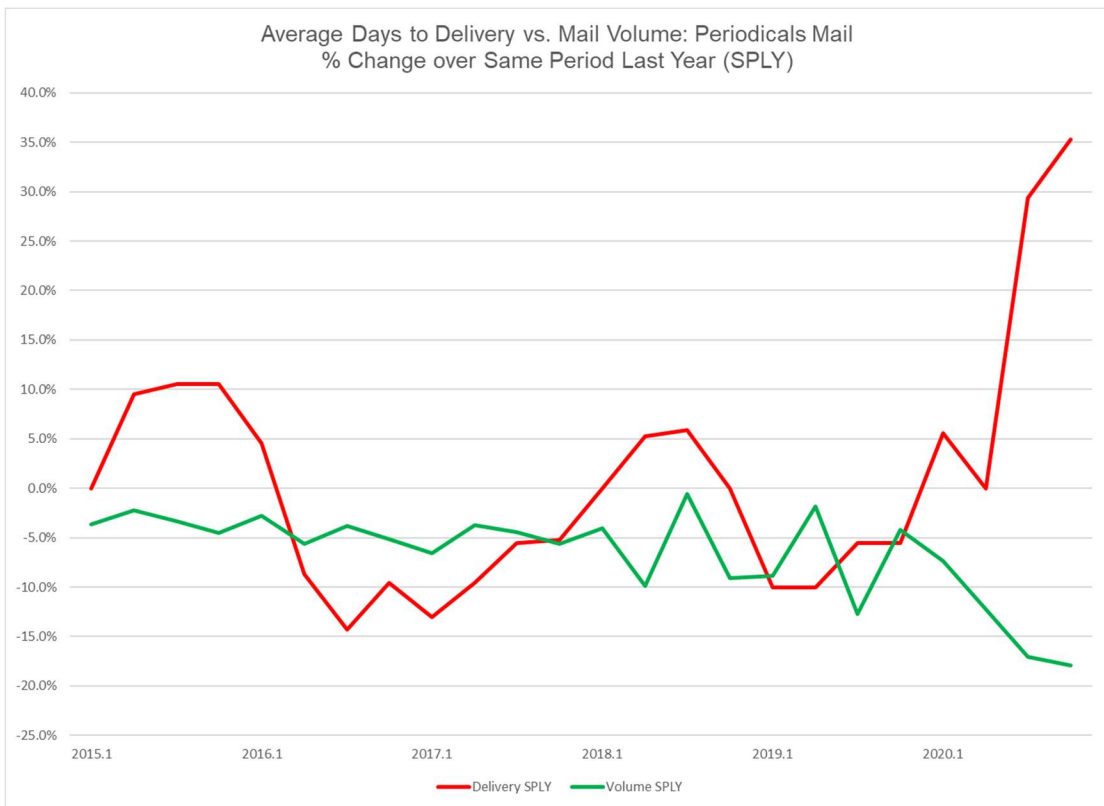
2

3

1   The visual relationship between mail volume and average days to delivery is

2   perhaps somewhat stronger for Periodicals Mail than for First-Class Mail although that

3   relationship appears to be a positive relationship through early 2020 with both average

4   delivery time and volume trending downward from 2014 through 2019.

5   The most striking negative relationship is over the last two quarters when average

6   delivery time for Periodicals Mail has increased from 1.7 days in 2019Q4 to 2.3 days in

7   2020Q4 while Periodicals Mail volume declined by 17.9 percent over the same time

8   period. Of course, longer delivery times was not the only factor affecting Periodicals

9   Mail volumes over the last half of FY 2020, as Periodicals Mail volumes were negatively

10   affected over this time period by the COVID-19 pandemic and the resulting weak

11   economy (as measured by employment within the econometric equations presented

12   here) as well as continued electronic diversion.

13

14   **2. Econometric Results**

15   The Postal Service estimates three demand equations associated with Periodicals

16   Mail: Regular Rate, Nonprofit (including Classroom), and Within County.

17   As with First-Class Mail, the functional form of the Postal Service's econometric

18   equations is "log-log" such that the dependent variable in the equation is the natural log

19   of mail volume and most of the explanatory variables are also constructed by taking the

20   natural log of the variable of interest. The resulting coefficients from a log-log equation

21   can be interpreted as "elasticities." An elasticity of e with respect to variable x indicates

22   that a 1% increase in the value of x would lead to an e% change in volume.

23   Average days to delivery, d, was added as a possible variable in the Periodicals

24   Regular Rate demand equation. As with First-Class Mail, the expected sign of the

1   coefficient on d would be negative – longer delivery times would be expected to reduce

2   volume, all other things being equal.

3   As discussed above, average delivery data were only available for Periodicals Mail

4   since 2014. The Periodicals Regular Rate demand equation filed with the PRC on

5   January 20, 2021 was estimated over a sample period starting in 2000Q1. Two

6   alternate approaches were taken to deal with the lack of delivery data for the first

7   fourteen years of the sample period (2000 – 2013). First, the sample period was

8   shortened to begin in 2014Q1. This had the result of causing the estimated own-price

9   elasticity for Periodicals Regular Mail to turn positive – with or without average days to

10   delivery included in the equation. Second, average days to delivery were assumed to be

11   constant prior to 2014Q1 (at the 2014Q1 value). Average days to delivery were tested

12   at various lags up to four quarters (one year) using both approaches. In both cases, the

13   best results were obtained using average days to delivery for all Periodicals lagged one

14   quarter.

15   The results of each of these approaches are shown in the table below where they

16   are compared to the baseline Periodicals Regular Rate equation which was filed with

17   the PRC on January 20, 2021.

18

19

Periodicals Regular Rate Mail

	Baseline	Shorter Sample	Longer Sample
Sample Period	2000Q1 – 2020Q4	2014Q1 – 2020Q4	2000Q1 – 2020Q4
Own-Price Elasticity	-0.130 (-1.510)	0.178 (0.652)	-0.107 (-1.268)
Avg Days to Delivery – lag 1	**-**	**-0.114 (-1.552)**	**-0.110 (-2.277)**
Employment	1.138 (8.748)	1.118 (5.991)	1.109 (8.726)
Time Trends Full-Sample	-0.0055 (-11.33)	-0.0168 (-10.64)	-0.0056 (-11.92)
Starting in 2011Q2	-0.0102 (-1.655)	-	-0.0098 (-2.000)
Starting in 2017Q4	-0.0170 (-9.485)	-0.0175 (-6.985)	-0.0166 (-7.800)
Mean-Squared Error	0.000350	0.000495	0.000330

20

1   The results are reassuringly consistent between the two approaches. The results

2 from the latter column – with a sample period starting in 2000Q1 with average days to

3 delivery held constant prior to 2014Q1 were adopted for my work here.

4   Average days to delivery for total Periodicals, modified in this way, was then tested

5 as an explanatory variable in the other two Periodicals equations.

6   Final results for all three Periodicals equations are presented below.

1   <u>Periodicals Regular Rate Mail</u>

2   The demand equation for Periodicals Regular Rate Mail is estimated over a sample

3   period of 2004PQ1 – 2020PQ4 and includes the following explanatory variables:

4

5   • Own-price elasticity lagged zero and one quarters

6   • Employment, current only

7   • Linear time trends starting in 2000PQ1 (full-sample), 2011PQ2, and
8   2017PQ4

9   • Non-linear intervention variable beginning in 2007PQ4

10   • Seasonal dummy variables

11

12

Periodicals Regular Rate Mail

	Baseline	Avg. Delivery Added
Own-Price Elasticity	-0.130 (-1.510)	-0.107 (-1.268)
Average Days to Delivery – lag 1	**-**	**-0.110 (-2.277)**
Employment	1.138 (8.748)	1.109 (8.726)

Time Trends
  Full-Sample
  Starting in 2011PQ2
  Starting in 2017PQ4
	
	-0.0055 (-11.33)
	-0.0102 (-1.655)
	-0.0170 (-9.485)
		
		-0.0056 (-11.92)
		-0.0098 (-2.000)
		-0.0166 (-7.800)

Mean-Squared Error	0.000350	0.000330

13

14   Numbers in parentheses are t-statistics. A t-statistic greater than two in absolute

15   value is generally regarded as statistically significant. The t-statistic on average delivery

16   time is -2.28 which is statistically significant.

17   Average days to delivery for Periodicals Mail has ranged from 1.7 days to 2.3 days

18   over the sample period used here. The coefficient on average delivery time, −0.110,

19   would translate into a volume decline of approximately 3.3 percent based on a change

20   in average days to delivery from 1.7 to 2.3.

1   Periodicals Within County Mail

2   Having optimized the Periodicals Regular Rate equation, average days to delivery

3   for total Periodicals Mail was tested as a potential explanatory variable in the demand

4   equations associated with Periodicals Within County and Nonprofit mail as well. In both

5   cases, average days to delivery were treated as constant prior to 2014Q1.

6   The results were most robust for Periodicals Within County Mail at the same lag as

7   for Periodicals Regular Rate Mail, one quarter.

8   The demand equation for Periodicals Within County Mail is estimated over a sample

9   period of 2008PQ1 – 2020PQ4 and includes the following explanatory variables:

10

11   •   Own-price elasticity (with no price lags)

12   •   Employment

13   •   Linear time trends starting in 2008PQ1 (full-sample) and 2019PQ1

14   •   Dummy variables, including seasonal variables

15
16

Periodicals Within County Mail

	Baseline	Avg. Delivery Added
Own-Price Elasticity	-0.186 (-1.327)	-0.128 (-0.893)
Average Days to Delivery – lag 1	-	**-0.087 (-1.503)**
Employment	0.903 (8.844)	0.854 (8.063)

Time Trends
   Full-Sample
   Starting in 2019PQ1
	
	 -0.0140 (-48.65)
	 0.0080 (3.582)
		
		 -0.0144 (-38.49)
		 0.0081 (3.649)

Mean-Squared Error	0.000461	0.000448

17

18   Numbers in parentheses are t-statistics. A t-statistic greater than two in absolute

19   value is generally regarded as statistically significant. The t-statistic on average delivery

20   time is -1.50 which does not quite rise to the usual standard for statistical significance.

21   The inclusion of average delivery time does, however, improve the mean-squared error

22   for the Periodicals Within County Mail equation.

23   The magnitude of the coefficient on average days to delivery here is broadly

24   consistent with most of the previous results of approximately -0.1.

1   Average days to delivery for Periodicals Mail has ranged from 1.7 days to 2.3 days

2   over the sample period used here. The coefficient on average delivery time, -0.087,

3   would translate into a volume decline of approximately 2.6 percent based on a change

4   in average days to delivery from 1.7 days to 2.3 days.

5

6   <u>Periodicals Nonprofit Mail</u>

7   The estimated coefficient on average days to delivery in the Periodicals Nonprofit

8   equation was consistently small and insignificant. The optimal lag was three quarters

9   but the results were largely interchangeable with a lag of one, two, or three quarters.

10   Given the general insignificance of the coefficient, it was therefore decided to use a lag

11   of one quarter for consistency with the other two Periodicals Mail equations.

12   The demand equation for Periodicals Nonprofit Mail is estimated over a sample

13   period of 2004PQ1 – 2020PQ4 and includes the following explanatory variables:

14

15   •   Own-price elasticity with zero through three quarters

16   •   Employment

17   •   Full-sample linear time trend

18   •   Dummy variables, including seasonal variables

19

20

Periodicals Nonprofit and Classroom Mail

	Baseline	Avg. Delivery Added
Own-Price Elasticity	-0.283 (-1.923)	-0.282 (-1.897)
Average Delivery Time – lag 1	-	**-0.019 (-0.215)**
Employment	0.186 (1.526)	0.180 (1.428)
Time Trends Full-Sample	-0.0097 (-24.65)	-0.0097 (-23.50)
Mean-Squared Error	0.000840	0.000852

21

22   Average days to delivery for Periodicals Mail has ranged from 1.7 days to 2.3 days

23   over the sample period used here. The coefficient on average delivery time, -0.019,

1   would translate into a volume decline of approximately 0.6 percent based on a change

2   in average days to delivery from 1.7 days to 2.3 days.

3

4   **3. Sources of Change**

5   Sources of change tables were constructed as described above for each of the three

6   Periodicals Mail equations to which average days to delivery were added above. The

7   resulting tables were aggregated into a single table for total Periodicals Mail which is

8   presented below.

9   The primary factor affecting Periodicals Mail volume over the past six years has

10 been the continuation of long-run negative trends away from physical newspapers and

11 magazines. In contrast, average delivery time has had only a modest impact on

12 Periodicals Mail volume. Further, as shown earlier, average days to delivery for

13 Periodicals Mail volume has not exhibited a consistent long-run trend so that the impact

14 of average days to delivery has varied in sign over the years shown here.

Sources of Change in Mail Volumes since 2014, Changes expressed in Changes in Total Volume

	Starting Volume	Population	Diversion Trends	Macro-Economy	Postal Prices	Inflation	Avg. Delivery Time	Other Factors	Final Volume
Periodicals Mail									
2014	6,359.0	69.4	(397.7)	80.8	(38.5)	16.5	**25.2**	(69.9)	6,044.7
2015	6,044.7	64.1	(373.6)	63.5	(36.5)	8.4	**(2.1)**	69.6	5,838.2
2016	5,838.2	59.4	(353.8)	60.9	(7.4)	6.4	**13.1**	(30.6)	5,586.2
2017	5,586.2	51.8	(347.2)	87.9	17.6	16.0	**50.2**	(161.9)	5,300.7
2018	5,300.7	43.3	(491.4)	37.7	(7.6)	19.7	**(1.3)**	92.7	4,993.8
2019	4,993.8	37.5	(479.3)	61.5	(17.1)	17.5	**29.7**	(9.0)	4,634.6
2020	4,634.6	34.3	(422.4)	(182.3)	(17.0)	12.6	**(20.2)**	(33.6)	4,006.1
Total	6,359.0	359.8	(2,865.5)	210.1	(106.5)	97.2	**94.5**	(142.6)	4,006.1

1

1 **III. Estimated Financial Impact of Service Standard Changes**

2   **A. Expected Change in Average Days to Delivery**

3   The equations presented in Section II above provide a basis for estimating the

4 potential change in First-Class Mail and Periodicals Mail volumes in response to a

5 change in service standards. In order to make such an estimate, it is first necessary to

6 estimate the expected change in average days to delivery due to the proposed service

7 changes.

8   The Postal Service estimates that the proposed changes to service standards could

9 increase average delivery time by as much as 19 percent within the affected delivery

10 networks.

11

12   **B. Estimated Volume Losses and Accompanying Financial Impact**

13   **1. Overview**

14   Given the functional form of the econometric demand equations presented in

15 Section II, given a coefficient on average days to delivery, e, the percentage change in

16 volume, v, due to a percentage change in average days to delivery, d, is solved via the

17 following formula:

18                                  $v = (1 + d)^e - 1$

19   So, for example, for a coefficient of -0.1, a 19 percent increase in average days to

20 delivery would lead to a 1.72 percent decline in mail volume:

21

22              $v = (1 + 19\%)^{-0.1} - 1 = 1.19^{-0.1} - 1 = 0.9828 - 1 = -1.72\%$

23

24   The total number of pieces of volume lost could then be calculated by multiplying

25 that percentage by a baseline level of volume. Multiplying lost volume by revenue per

26 piece would generate the estimated loss in gross revenue to the Postal Service due to

27 changes in average days to delivery. Multiplying lost volume by contribution per piece

1 would generate the estimated net financial impact of changes in average days to

2 delivery to the Postal Service.

3

4 **2. First-Class Mail**

5 Applying the econometric coefficients on average days to delivery from Section II.B.

6 to a 19 percent expected increase in average days to delivery would reduce First-Class

7 Single-Piece Mail volume by approximately 1.71 percent. Using FY 2020 numbers as

8 baselines, that would translate into a loss of 270.8 million pieces of First-Class Mail

9 Single-Piece Mail. Multiplying by FY 2020 revenue per piece, this would translate into a

10 loss in gross revenue of $156.9 million. Multiplying the volume loss by contribution per

11 piece from the FY 2020 CRA, this would lead to an expected decline in contribution of

12 approximately **$54.3 million**.

13 A 19 percent expected increase in average days to delivery would be expected to

14 reduce First-Class Workshare Mail volume by approximately 0.69 percent, which (using

15 FY 2020 numbers) translates into a loss of 252.3 million pieces of mail, $96.7 million in

16 gross revenue, and **$56.6 million** in lost contribution.

17 Adding these together, the expected losses to First-Class Mail if average days to

18 delivery increased by 19 percent would be 523.1 million pieces of mail, $253.6 million in

19 gross revenue, and **$110.9 million** in lost contribution.

20

21 **3. Periodicals Mail**

22 The proposed service standards are only expected to affect seven percent of

23 Periodicals Mail volume. Hence, a 19 percent increase in average days to delivery for

24 affected mail would only increase average delivery time for total Periodicals Mail by 1.3

25 percent (19% times 7%). Applying the econometric coefficients on average days to

26 delivery from Section II.C. to a 1.3 percent expected increase in average days to

27 delivery would reduce Periodicals Mail volume by approximately 0.11 percent. Using

1   FY 2020 numbers as baselines, that would translate into a loss of 4.3 million pieces of

2   Periodicals Mail and $1.2 million in gross revenue. Contribution per piece for

3   Periodicals Mail was negative in FY 2020 so that a reduction in volume of 4.3 million

4   pieces would lead to a slight increase in total expected contribution to the Postal

5   Service of $0.8 million.

**LIBRARY REFERENCE SPONSORED BY UNITED STATES POSTAL SERVICE
WITNESS THOMAS THRESS**

United States Postal Service Witness Thomas Thress sponsors the following library

reference:

- USPS-LR-N2021-5 – Econometric Analysis of Impact Delivery Service Standards on

  First-Class Mail and Periodicals Mail

RESPONSES OF USPS WITNESS THRESS TO INTERROGATORIES OF NPPC

NPPC/USPS-T5-1. Please refer to the "Sources of Change" table presented at page 21 of your testimony. That table indicates that electronic diversion accounts for more of the change in First-Class Workshare volume than does average days of service.

Assume that slower or inconsistent delivery could be a reason driving First-Class Presort mailers' migration to electronic alternatives. (That is, a repeated failure to achieve delivery standards might cause a mailer to increase conversion to electronic alternatives.) Would your model pick up this phenomenon in the electronic diversion factor or in the average days of delivery factor?

RESPONSE:

It is true that it can be difficult to separately estimate the impact of two explanatory variables which tend to change simultaneously over time. In this case, however, the average days to delivery variable follows a meaningfully different pattern from the time trends which are included in my models to capture on-going mail diversion.

Given the relative stability of the average delivery variable associated with First-Class Presort Mail (see page 8 of my testimony), I am not sure what you mean by "slower or inconsistent delivery" over the sample period over which I have estimated my equations.

RESPONSES OF USPS WITNESS THRESS TO INTERROGATORIES OF NPPC

NPPC/USPS-T5-2. Does the model indicate how much of the shift from First-Class Presort Mail to electronic delivery has been caused by mailers' dissatisfaction with delivery speed? If so, please explain where the model does so.

RESPONSE:

      Please see my response to NPPC/USPS-T5-1.

NPPC/USPS-T5-3. The following chart compares the price elasticity of First-Class Presort Mail in FY2020 as presented in the Postal Service's econometric demand model filed in January 2021 (column 1) with the price elasticity presented in this case, which includes the average delivery factor (right column).

Comparison of First-Class
Mail Elasticities

Product	FY 2020	N2021-1 Avg. Delivery Added
Single-Piece Letters	-0.148	-0.173
Single-Piece Cards	-0.373	-0.364
Single-Piece Flats	-0.248	-0.199
Workshare Letters	-0.231	-0.255
Workshare Cards	-0.413	-0.485
Workshare Flats	-0.319	-0.374

a. Please confirm that the price elasticities presented in columns 1 and 2 are correctly copied from their respective sources.
b. Please confirm that the price elasticities in the econometric demand model filed in January 2021 served as the baseline for your calculations presented in this case. If you cannot confirm, please explain.
c. Please confirm that for Single-Piece Letters, Workshare Letters, Workshare Cards, and Workshare Flats, the price elasticities increased when the factor for average days of delivery was included. If you cannot confirm, please explain why not.
d. Please explain, to the best of your understanding, why the price elasticity of the four products in (c) would increase when a factor for average days of delivery is included.

RESPONSE:

a. Confirmed.

b. Confirmed.

c. Confirmed.

d. Mathematically, the addition of a new explanatory variable will affect the estimated coefficient on an existing variable to the extent to which the two variables are correlated. In this case, none of the differences in own-price elasticity are significant in either a statistical or a practical sense. In fact,

all of the differences in the own-price elasticity estimates shown here are

less than one-half the standard error of the elasticity estimates and the

fact that four of the six changes are in the same direction is unremarkable.

**RESPONSE OF UNITED STATES POSTAL SERVICE WITNESS THRESS TO
INTERROGATORIES OF POSTCOM**

PostCom/USPS-T5-2. Please refer to USPS T-5 at pages 36-38 and Library Reference Library Reference LR-N2021-1-5. Please confirm that in applying the 18% increase in average days to delivery figure to determine the financial impact of the changes, Witness Thress applied the 18% against the entire volume of the particular category. For instance, please confirm that Mr. Thress's determination that an 18% increase in average days for delivery for FCM Workshare Mail would reduce volume by 0.65%, or 240.2 million pieces of mail, which results in $53.9 million in lost contribution, is derived by applying the 18% figure against the entire volume of FCM Workshare Mail, regardless of whether mail within that category would actually experience a change in service standards.

    a. Did Mr. Thress or the Postal Service attempt to determine the increase in average days to delivery only for the mail that will experience a change in service standards?

RESPONSE:

    2. Confirmed.

        a. No.

**RESPONSE OF UNITED STATES POSTAL SERVICE WITNESS THRESS TO
INTERROGATORIES OF POSTCOM**

PostCom/USPS-T5-4.   Please refer to USPS-T-5 at page 8 and the chart
"Average Days to Delivery vs. Mail Volume: First Class Workshare Mail," and the
tab "Data" in the "Thress" spreadsheet in Library Reference LR-N2021-1-5. Please
confirm that the average days to delivery for First Class Workshare Mail did not
exceed 2.4 days between FY 2009 Q3 and FY 2020 Q3.

    a. Please confirm that this average days to delivery figure falls within the
current service standard for First Class Mail of 1-3 days.

    b. Has Witness Thress or the Postal Service determined the average days to
delivery for First Class Workshare Mail currently subject to a 3-day service
standard?

RESPONSE:

    4. Confirmed.

        a. Confirmed.

        b. No.

**RESPONSE OF UNITED STATES POSTAL SERVICE WITNESS THRESS
(REDIRECTED IN PART FROM WITNESS MONTEITH) TO PRESIDING OFFICER'S
INFORMATION REQUEST NO. 1**

Question 29. In USPS-T-4, witness Monteith states, "To develop the projections, Thress evaluated the impact to [First-Class Mail] volume if Delivery Time increased by 18 percent as a result of the proposed service standard changes." *Id.* Please also refer to USPS-T-4 stating, "To develop the projections, Thress evaluated the impact to Periodicals if Delivery Time increased by 18 percent as a result of the proposed service standard changes and holding price and costs constant." *Id.* at 17. Lastly, please refer to Direct Testimony of Thomas E. Thress on Behalf of the United States Postal Service (USPS-T-5), April 21, 2021, in which witness Thress states, "The Postal Service estimates that the proposed changes to service standards could increase average delivery time by as much as 18 percent within the affected delivery networks." USPS-T-5 at 36.

      f.   If question 29.e. is confirmed, please explain whether it would be possible to feed more granular inputs of increase in Delivery Time through witness Thress's models to estimate volume loss, and subsequently the effect on contribution, for specific products and classes in USPS-T-5. If not confirmed, please explain why it is not possible to feed in the more granular inputs into the model and estimate product and class-specific contributions.

RESPONSE:

The relationship between average delivery time and mail volume which I modeled in

USPS-T-5 was estimated based on total mail volume and average delivery days across

all mail. The estimates presented in my testimony represent the average impact across

all mail and all mailers and may not be indicative of the specific impact of any particular

mailer. Mailers may also be expected to make volume decisions based on the average

delivery times for all of their mail, some of which may or may not be subject to the

changes being proposed in this case. Care should therefore be taken in attempting to

apply these results to more granular sub-categories of mail.

RESPONSES OF UNITED STATES POSTAL SERVICE WITNESS THRESS TO PRESIDING OFFICER'S INFORMATION REQUEST NO. 2

Question 20. Please refer to USPS-T-5 at 25.
   a. Please provide a general explanation of how you assess the goodness-of-fit of each of the econometric models discussed in your testimony.
   b. Please explain how well the model you have provided fits the actual data provided from the years 2015 to 2017. To the extent that any differences exist, what is the difference between the predicted and actual dependent variables for each of those years?

RESPONSE:

a.

The primary statistic by which I measure goodness-of-fit for my econometric models is mean-squared error (sum of squared residuals divided by degrees of freedom). In choosing between alternate variables (or, for example, alternate lags of a particular variable), the t-statistic on the estimated coefficient of the variable is also a primary consideration.

The decision of whether to include a variable within a particular equation is not, however, a purely statistical decision. The theoretical importance of a variable is also taken into consideration. So, for example, Postal Service prices are generally included in my econometric models even if the inclusion of price increases the mean-squared error for the equation, so long as the estimated own-price elasticity is of the expected sign (negative).

For the present case, I was asked to provide the best estimate of the volume losses which might be expected to result from the Postal Service's proposed changes to service standards. For some of the equations which I evaluated, the coefficient on the delivery variable was not statistically significant and its inclusion increased the mean-squared error of the model. Delivery time was still included in these models as the theoretical expectation that increased delivery times might be expected to lead to

volume losses overcame a simple evaluation of statistical significance. I also found it reassuring that the final estimated coefficients on average delivery time were highly consistent across the equations which I estimated at approximately -0.1 (with the exception of First-Class Workshared Letters).

b.

Full econometric output for the models which I present in my testimony can be found in the file out_ad.txt which was filed as part of Library Reference LR-N2021-1-5. This output includes regression residuals, which are equal to actual volume minus fitted volume. The dependent variables in my econometric equations are logged volumes (per adult per day), so these residuals can be interpreted as percentage differences between actual and fitted volumes.

Residuals for the equations which I present which did not include delivery time were filed as part of the Postal Service's annual filing with the Postal Regulatory Commission on January 20, 2021.

The traditional method of grouping residuals for statistical analysis is the sum of squared residuals. The sum of squared residuals over the three-year period from FY 2015 through FY 2017 for the nine equations presented in my testimony, with and without the delivery variables, are summarized in the table below.

RESPONSES OF UNITED STATES POSTAL SERVICE WITNESS THRESS TO PRESIDING OFFICER'S INFORMATION REQUEST NO. 2

Delivery	Excluded	Included
First-Class SP Letters	0.001800	0.001549
First-Class SP Cards	0.010402	0.010081
First-Class SP Flats	0.002554	0.001790
First-Class WS Letters	0.000147	0.000202
First-Class WS Cards	0.017748	0.021195
First-Class WS Flats	0.006019	0.007826
Periodicals Regular	0.001825	0.002339
Periodicals In-County	0.003137	0.002876
Periodicals Nonprofit	0.004325	0.004329

**RESPONSE OF UNITED STATES POSTAL SERVICE WITNESS THRESS
(REDIRECTED FROM WITNESS MONTEITH)
TO PRESIDING OFFICER'S INFORMATION REQUEST NO. 3**

Question 26. Response to POIR No. 1, question 29.e., states "[i]t is possible to derive increases in Delivery Time for (1) Presort Letters &Cards, (2) Presort Flats, (3) Single-Piece Letters & Cards, and (4) Single-Piece Flats. Response to POIR No. 1, question 29.f., states "[t]he relationship between average delivery time and mail volume which I modeled in USPS-T-5 was estimated based on total mail volume and average delivery days across all mail. The estimates presented in my testimony represent the average impact across all mail and all mailers and may not be indicative of the specific impact of any particular mailer."

    a. Please confirm whether it is possible to model the relationship between average delivery time and mail volume for specific mail products, such as those referenced in the Response to POIR No. 1, question 29.e. ((1) Presort Letters &Cards, (2) Presort Flats, (3) Single-Piece Letters & Cards, and (4) Single-Piece Flats).

    b. If confirmed, please explain the advantages and disadvantages of using a more disaggregated model. In your response, please include the reason the Postal Service ultimately chose a more aggregated model.

    c. If not confirmed, please explain why such disaggregated modeling is not possible.

RESPONSE:

    a. Confirmed. The equations which I presented in my testimony used this precise breakdown (in fact, I estimated separate equations for Letters and Cards) (see USPS-T-5, pages 11 through 17). My estimates of the financial impact of the Postal Service's proposals in this case were calculated separately for each of the six equations which I estimated based on the separate estimated delivery coefficients in these equations. The numbers which I cite at page 37 of my testimony are simply the sum of these six separate numbers, which can be found on sheet 'Financial Impact' of the spreadsheet Thress.xlsx which was filed as part of Library Reference LR-N2021-1-5 in this case.

        My response to POIR 1, 29.f., perhaps misunderstood what was meant by "more granular inputs". I interpreted that to refer to differences in the delivery standards associated with particular pieces of mail.

**RESPONSE OF UNITED STATES POSTAL SERVICE WITNESS THRESS
(REDIRECTED FROM WITNESS MONTEITH)
TO PRESIDING OFFICER'S INFORMATION REQUEST NO. 3**

b. Please see my response to subpart a.

c. N/A

**RESPONSE OF UNITED STATES POSTAL SERVICE WITNESS THRESS TO
PRESIDING OFFICER'S INFORMATION REQUEST NO. 3**

Question 29. Please refer to USPS-T-5 at 24. The average days-to-delivery fell by
9.4% in 2014 and then increased by 14.6% in 2015.
   a. Please explain why the 9.4% decrease in days-to-delivery does not appear in the
   top figure on page 6 of your testimony.
   b. Please confirm whether you performed a detailed econometric analysis of the
   relationship between volume and days-to-delivery during the period of large
   changes that occurred from 2012 – 2015. If confirmed, please provide the results
   of this analysis, including a discussion of whether you estimated a
   microeconometric model known as Regression Discontinuity Design. If not
   confirmed, please explain why you did not perform a more detailed investigation
   into this time period.

RESPONSE:

   a. The table at page 24 presents annual data for total First-Class Mail. The figures

   at page 6 of my testimony show quarterly data for First-Class Single-Piece Mail.

   Hence, the specific numbers are not directly comparable between the two tables.

   b. I did not perform any detailed econometric analysis of the time period from 2012

   to 2015 to the exclusion of the periods before and after this time period. The

   purpose of my testimony was "to provide an estimate of the potential loss of First-

   Class Mail and Periodicals Mail volumes resulting from the changes in service

   standards being proposed by the United States Postal Service." In order to

   develop the best possible estimate of the specific changes expected from the

   specific proposals made the Postal Service in this case, it is necessary, but it is

   not sufficient, to evaluate the impact of the changes in delivery time during the

   2012 to 2015 time period.

      My understanding of "Regression Discontinuity Design" is that it is similar

   conceptually to the intervention approach used in several of the econometric

   equations which I have developed for the Postal Service. Such an intervention

   can quantify the specific impact of a unique event (e.g., the impact of the Great

Recession on Marketing Mail volumes). But unless one expects such a unique event to exactly repeat itself, this may be of only limited value in estimating the potential impact of unique future events. Including the time periods before and after the 2012 – 2015 period allow one to develop estimates which are more easily and reliably generalized to possible future situations.

It is also important, even in attempting to estimate the unique impact of one-time events, to control for other factors. Hence, even in cases where intervention analysis is warranted, these intervention variables are placed inside existing econometric models which include additional factors, and which span longer sample periods.

It was decided that the best approach here was to add average days to delivery to the existing econometric models to best control for the impact of other factors and to allow for a result (a coefficient on average days to delivery) which could be directly applied to the Postal Service's proposals in this case.

See also my response to POIR No. 2, Question 20 (filed on May 21, 2021).

**RESPONSE OF UNITED STATES POSTAL SERVICE WITNESS THRESS TO
PRESIDING OFFICER'S INFORMATION REQUEST NO. 3**

Question 30. Please discuss the advantages and disadvantages of estimating an
Ordinary Least Squares regression model to identify causal parameters outside the
scope of a randomized control trial.
    a. Do you find that data drawn from period of analysis, 2000—2020, satisfy the
        necessary identification assumptions required for estimates based on an
        Ordinary Least Squares regression model to be unbiased and consistent,
        therefore allowing the researcher to make statistical statements about the
        underlying population parameter of interest? If yes, please explain. If no, please
        explain what other assumptions you have made to allow for the causal
        interpretation of estimates that is seen throughout this testimony.

RESPONSE:

The primary advantage of an Ordinary Least Squares[1] regression model is the

ability to isolate the impact of multiple factors on a single dependent variable (e.g., mail

volume). Such models are most reliable when the model is fully specified (i.e., it

includes all relevant potential explanatory variables) and the explanatory variables are

not meaningfully correlated with each other.

The tradeoff in such modeling, identified in question 31 as the "bias-variance

tradeoff", is between including all possible explanatory factors, which is necessary to

ensure the model is unbiased, while limiting the extent to which factors are correlated

with one another (i.e., multi-collinearity), to ensure the model is consistent.

Yes. The average days to delivery data have the desirable property of not being

meaningfully correlated with the other explanatory variables in the equations which I

have estimated here, so that the impact of specific factors can be more clearly

identified. See also my responses to POIR No. 2, Question 20 (filed on May 21, 2021),

and NPPC/USPS-T-5, Questions 1 and 3 (filed on May 26, 2021).

---

[1] Technically, my econometric models are Generalized Least Squares (GLS) models. A
Generalized Least Squares model allows for somewhat more flexibility than Ordinary Least Squares
(OLS) models regarding the assumptions necessary to ensure lack of bias and consistency. The general
discussion here is, however, applicable to both OLS and GLS frameworks.

RESPONSE OF UNITED STATES POSTAL SERVICE WITNESS THRESS TO PRESIDING OFFICER'S INFORMATION REQUEST NO. 3

Question 31. Please explain why adding days-to-delivery as an additional covariate in your econometric forecasting model increases the accuracy of the econometric volume forecast.

    a. Please explain why this explanatory variable was not included in any previously filed forecasting models.

    b. Please discuss whether the Postal Service intends to continue to include this explanatory variable in future forecasting models.

    c. Please discuss the bias-variance trade-off that exists when a researcher adds additional explanatory variables to an econometric model, including the implications of the bias-variance trade-off in this specific case of adding additional explanatory variables to this forecasting model, such as days-to-delivery.

    d. In evaluating the merits of including days-to-delivery among the large set of explanatory variables included in the volume forecast model, did you undertake any out-of-sample testing of the final forecasting model. For example, estimating your model based on half of the historical data, and then evaluating the performance of your model, for example, the Mean Squared Error, based on the other half of the historical data.

RESPONSE:

Strictly speaking, the goal of my work in this case was not to develop the most accurate possible econometric forecast model for the Postal Service. And, in fact, I have presented no actual volume forecasts in this case. The purpose of my testimony was to provide the Postal Service with the best possible estimate of the potential impact of its proposed service standard changes on mail volumes (and, by extension, Postal Service revenue and contribution).

While forecast accuracy is always a desirable property of any econometric model, it was not my primary consideration in this case. See, however, my answer to question 30 and to the sub-parts of this question.

    a. Average days to delivery has not previously been included in the Postal Service's regular forecasting models primarily because average days to delivery has generally not varied much over time, so that its possible inclusion in the First-Class Mail equations seemed unlikely to be worth the "bias-variance trade-off".

b. The most recent forecast models used by the Postal Service do include average days to delivery as an explanatory variable. Recent changes in average days to delivery have been more substantial than in the past. Between this and the expected changes to delivery times resulting from the Postal Service's proposals in this case, it seems likely that delivery time will have a larger expected impact on mail volumes over the next few years than it has had historically.

c. Please see my response to POIR No. 3, Question 30.

d. The econometric output filed with this case (out_ad.txt in LR-N2021-1-5) includes several out-of-sample analyses. The most significant of these is a set of recursive residuals which present a series of one-quarter-ahead forecast errors expressed on a scale similar to t-statistics.

An example of the recursive residual analysis for First-Class Single-Piece Letters is presented below.

```
                        Recursive Residuals
                        (normalized: (Ln(Actual) - Ln(Forecast)) / SE
           Quarter 1      Quarter 2      Quarter 3      Quarter 4
```

	Quarter 1	Quarter 2	Quarter 3	Quarter 4
2007	-0.727	-0.375	0.242	-1.511
2008	0.914	0.800	0.547	-3.417
2009	-0.692	-0.211	-2.554	0.128
2010	1.632	-0.968	0.801	-0.135
2011	-0.229	-1.119	0.498	0.691
2012	0.440	0.548	0.886	3.074
2013	0.317	0.723	1.303	-1.241
2014	-0.370	0.374	-0.441	-0.147
2015	-2.076	-1.238	0.398	0.689
2016	1.288	-0.135	0.115	-0.626
2017	0.184	-0.749	-0.278	2.661
2018	0.752	0.330	-1.458	-0.675
2019	3.080	-0.745	-0.134	-1.111
2020	0.414	0.274	-0.159	-0.109

In addition, an analysis of the most recent eight quarters was conducted for each

equation. Dummy variables are added to the model for each of the last eight quarters of the sample period. The coefficients of these dummy variables can be interpreted as out-of-sample forecast errors for this time period.

This analysis for First-Class Single-Piece Letters is presented below.

```
                          Quarters Dummied Out


                   Coefficients    Std. Error      T-Ratio


D2019Q1               0.044937       0.015727      2.857218
D2019Q2               0.001924       0.018129      0.106113
D2019Q3               0.007277       0.018459      0.394246
D2019Q4              -0.006995       0.019113     -0.365997
D2020Q1               0.020812       0.020721      1.004388
D2020Q2               0.016502       0.021118      0.781425
D2020Q3               0.011098       0.026390      0.420531
D2020Q4               0.009300       0.023915      0.388892


--------------------------------
Mean Dummy Coefficient      0.013107
Mean-Squared Error          0.000380
```

Results for the other equations which I presented in my testimony can be found in the file out_ad.txt which was filed as part of Library Reference LR-N2021-1-5 (filed on April 21, 2021) in this case.

I did not make any efforts to conduct any more extensive out-of-sample analysis, such as estimating my model over only half of the sample period.

SH/USPS-T5-1. Please refer to your testimony on Docket No. R2010-4R, Sept. 26, 2013, "Further Statement," p. 8, Table 2, "Exigent Postal Service Losses, FY 2008 – 2012."

TABLE TWO: Exigent Postal Service Losses, FY 2008 – 2012

| First-Class Mail | Starting Volume | Population | Pre-Existing Non-Macro-Economic Factors | | | | | Macro-Economy & Recession-Induced Factors | Final Volume |
			Diversion	Trends	Nominal Price	Inflation	Other Factors		
2008	95,347.0	1,059.4	(2,657.2)	744.3	(1,787.4)	973.5	918.4	**(3,926.9)**	90,671.2
2009	90,671.2	923.6	(2,429.7)	671.5	(747.6)	173.2	(425.1)	**(6,110.1)**	82,727.0
2008 - 2009	95,347.0	1,983.0	(5,086.9)	1,415.8	(2,535.0)	1,146.8	493.3	**(10,037.0)**	82,727.0
2010	82,727.0	855.2	(2,224.5)	594.5	(512.2)	257.4	888.8	**(4,994.6)**	77,591.6
2008 - 2010	95,347.0	2,838.2	(7,311.4)	2,010.3	(3,047.2)	1,404.1	1,382.1	**(15,031.7)**	77,591.6
2011	77,591.6	819.9	(2,055.2)	543.3	(78.7)	461.1	(747.7)	**(4,012.3)**	72,521.9
2008 - 2011	95,347.0	3,658.1	(9,366.6)	2,553.6	(3,125.9)	1,865.2	634.4	**(19,044.0)**	72,521.9
2012	72,521.9	809.4	(1,911.6)	496.2	(463.0)	527.6	239.5	**(3,546.2)**	68,673.7
2008 - 2012	95,347.0	4,467.5	(11,278.2)	3,049.8	(3,588.9)	2,392.8	873.9	**(22,590.2)**	68,673.7

Please confirm the table shows diversion was responsible for a loss of 2,055.2 million pieces in 2011 and 1,911.6 million in 2012; that negative impacts (diversion, nominal price, other factors, and macro-economy & recession induced factors) totaled 6,893.9 million in 2011 and 5,681.4 million in 2012; and that diversion was therefore responsible for approximately 30 percent of these negative impacts in 2011 and 34 percent in 2012.

RESPONSE:

Not confirmed.

The figures 2,055.2 and 1,911.6 referenced here refer to the "pre-existing" diversion trends which were in operation prior to the start of the Great Recession. Included within the "recession induced factors," then, were additional negative trends which began coincident with the Great Recession and which were, in my judgment, triggered by the Great Recession.

The "Macro-Economy and Recession-Induced Factors" presented at page 8 of my testimony in Docket No. R2010-4R were calculated within USPS-R2010-4R/10 filed with that case. The spreadsheet ExigentImpact.xlsx within that folder decomposes the sub-factors which are combined within Table 2 of my testimony at columns D and W.

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Per this spreadsheet, additional trends triggered by the Great Recession accounted for volume losses for First-Class Mail of 3,696.8 million pieces in FY 2011 and 3,478.1 million pieces in FY 2012 (column W of sheet 'Volume' of ExigentImpact.xlsx, filed with USPS-R2010-4R/10, sum of individual First-Class Mail categories). Added to the pre-existing losses, the models filed in Docket No. R2010-4R (subsequently redesignated as Docket No. R2013-11) estimated First-Class Mail losses due to diversion trends of approximately 5,752.0 million pieces in FY 2011 and 5,389.7 million pieces in FY 2012.

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SH/USPS-T5-2. Please refer to your testimony for N2021-1, p. 21, the table entitled "Sources of Change in Mail Volumes since 2010."

Sources of Change in Mail Volumes since 2010, Changes expressed in Changes in Total Volume

	Starting Volume	Population	Diversion Trends	Macro-Economy	Postal Prices	Inflation	Avg. Delivery Time	Other Factors	Final Volume
First-Class Mail									
2011	77,591.6	815.0	(4,438.7)	335.0	(117.4)	391.7	(48.3)	(2,007.1)	72,521.9
2012	72,521.9	813.0	(4,175.2)	561.2	(373.6)	450.5	(133.4)	(986.3)	68,678.1
2013	68,678.1	777.1	(3,361.5)	406.9	(375.7)	282.6	(95.2)	(179.6)	66,132.8
2014	66,132.8	724.8	(2,672.7)	476.5	(603.4)	241.7	(48.7)	(176.9)	64,074.0
2015	64,074.0	680.3	(2,324.1)	582.0	(505.8)	112.6	350.3	(194.0)	62,775.4
2016	62,775.4	642.3	(2,538.9)	436.1	(53.9)	102.9	(646.3)	665.5	61,383.2
2017	61,383.2	571.0	(3,435.9)	353.7	301.0	257.6	131.1	(615.3)	58,946.3
2018	58,946.3	482.3	(3,332.0)	375.4	(74.0)	315.6	24.2	61.3	56,799.1
2019	56,799.1	430.4	(2,647.8)	315.5	(237.8)	275.3	(42.3)	111.6	55,003.9
2020	55,003.9	417.7	(2,139.3)	(2,074.8)	(211.9)	205.9	52.6	1,420.9	52,674.9
Total	77,591.6	6,353.9	(31,066.2)	1,767.5	(2,252.5)	2,636.5	(456.0)	(1,899.9)	52,674.9

Please confirm that the table shows that "diversion trends" were responsible for a loss of 4,438.7 million pieces in 2011 and 4,175.2 million in 2012; that negative impacts (diversion trends, postal prices, average delivery time, and other factors) totaled 6,611.5 million in 2011 and 5,668.4 million in 2012; and that diversion was therefore responsible for approximately 67 percent of total negative impacts in 2011 and 74 percent in 2012.

RESPONSE:

Confirmed.

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SH/USPS-T5-3. Please explain why your calculations indicate that the percentage of volume losses due to diversion in 2011 and 2012, as presented in your testimony for N2021-1, are more than double the losses during these years as presented in your testimony for R2010-4R.

RESPONSE:

Per my response to SH/USPS-T-5-1, my testimony in Docket No. R2010-4R actually implied that diversion trends explained First-Class Mail volume losses of 5,752.0 million pieces in FY 2011 and 5,389.7 million pieces in FY 2012, as compared to my more recent estimates of 4,438.7 million and 4,175.2 million, respectively.

Hence, my most recent estimates are, in fact, smaller than the estimates from my testimony for Docket No. R2010-4R. As to why they are smaller, the difference is that, in retrospect, some of the volume declines that were continuing into FY 2012 did eventually subside (further reinforcing my belief that these factors were properly attributed to the Great Recession). This has been recognized in my more recent econometric equations by introducing a series of step-down dummy variables starting in 2010, 2011, and 2012 (D2010Q2ON, D2011Q2ON, and D2012Q2ON) in the First-Class Single-Piece Letters equation (see my econometric output, out_ad.txt, filed as part of Library Reference USPS-LR-N2021-1-5 in this case). The impact of these variables is reflected within the column labeled "Other Factors" at page 21 of my current testimony.

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SH/USPS-T5-4. Please refer to your testimony, p. 24, showing the table "First-Class Mail volumes vs. Average Delivery Time, by Type of Mail: 2005 – 2020 (annual)."

<u>First-Class Mail volumes vs. Average Delivery Time, by Type of Mail: 2005 - 2020 (annual)</u>

	First-Class Mail								
	Sent by Households (HDS)		Non-Household to Household (HDS)						Avg. Delivery
	Correspondence	Bill Payments	Correspondence	Advertising	Bills	Statements	Other	Total (RPW)	Days
2005	7,989.3	8,970.2	19,223.3	10,782.3	17,872.2	6,272.2	26,466.3	97,575.8	2.02
2006	8,265.6	8,733.5	18,494.9	10,344.4	18,335.5	6,642.5	26,119.2	96,935.7	2.03
2007	7,943.8	8,365.2	18,820.6	9,033.8	18,202.0	6,809.3	26,168.8	95,343.6	2.09
2008	7,729.4	6,995.2	18,087.3	8,257.3	17,978.3	6,293.7	25,330.0	90,671.2	2.13
2009	7,135.8	6,493.9	16,795.5	6,648.5	17,116.5	6,386.5	22,150.3	82,727.0	2.02
2010	5,590.8	5,632.3	15,994.6	6,115.1	15,365.2	5,417.8	23,475.8	77,591.6	2.07
2011	4,964.9	5,516.9	16,280.9	5,447.8	15,180.6	4,655.1	20,475.7	72,521.9	2.13
2012	5,009.2	5,097.9	16,311.4	5,021.3	14,847.0	4,744.5	17,642.4	68,673.7	2.13
2013	4,916.0	4,513.0	15,497.2	4,240.1	14,268.8	4,284.9	18,171.7	65,891.7	2.18
2014	4,403.4	4,470.0	15,407.8	3,924.8	14,102.8	4,513.9	17,026.4	63,849.0	1.98
2015	4,607.4	4,382.6	15,003.7	3,593.4	13,842.1	4,204.1	16,965.5	62,598.8	2.27
2016	4,046.8	3,752.8	15,143.6	3,826.0	13,594.6	3,994.0	16,881.3	61,239.1	2.23
2017	3,554.7	3,341.4	15,014.6	3,712.2	12,629.7	4,050.9	16,529.7	58,833.3	2.23
2018	3,440.8	3,100.2	14,774.6	3,504.0	12,526.0	3,930.7	15,435.3	56,711.6	2.29
2019	3,319.1	2,784.0	14,102.5	3,972.8	11,367.5	3,741.4	15,649.4	54,936.7	2.27
2020	3,133.6	2,467.2	13,621.5	3,470.2	10,593.6	3,870.6	15,466.1	52,622.8	2.32
SPLYs									
2006	3.5%	-2.6%	-3.8%	-4.1%	2.6%	5.9%	-1.3%	-0.7%	0.4%
2007	-3.9%	-4.2%	1.8%	-12.7%	-0.7%	2.5%	0.2%	-1.6%	2.9%
2008	-2.7%	-16.4%	-3.9%	-8.6%	-1.2%	-7.6%	-3.2%	-4.9%	1.8%
2009	-7.7%	-7.2%	-7.1%	-19.5%	-4.8%	1.5%	-12.6%	-8.8%	-5.0%
2010	-21.7%	-13.3%	-4.8%	-8.0%	-10.2%	-15.2%	6.0%	-6.2%	2.4%
2011	-11.2%	-2.0%	1.8%	-10.9%	-1.2%	-14.1%	-12.8%	-6.5%	2.8%
2012	0.9%	-7.6%	0.2%	-7.8%	-2.2%	1.9%	-13.8%	-5.3%	0.2%
2013	-1.9%	-11.5%	-5.0%	-15.6%	-3.9%	-9.7%	3.0%	-4.1%	2.5%
2014	-10.4%	-1.0%	-0.6%	-7.4%	-1.2%	5.3%	-6.3%	-3.1%	-9.4%
2015	4.6%	-2.0%	-2.6%	-8.4%	-1.8%	-6.9%	-0.4%	-2.0%	14.6%
2016	-12.2%	-14.4%	0.9%	6.5%	-1.8%	-5.0%	-0.5%	-2.2%	-1.5%
2017	-12.2%	-11.0%	-0.9%	-3.0%	-7.1%	1.4%	-2.1%	-3.9%	-0.1%
2018	-3.2%	-7.2%	-1.6%	-5.6%	-0.8%	-3.0%	-6.6%	-3.6%	2.6%
2019	-3.5%	-10.2%	-4.5%	13.4%	-9.2%	-4.8%	1.4%	-3.1%	-1.1%
2020	-5.6%	-11.4%	-3.4%	-12.7%	-6.8%	3.5%	-1.2%	-4.2%	2.5%

Please confirm that during the period 2005-2020 the only year for which delivery time increased more than 2.9 percent over the previous year was 2015, when the increase was 14.6 percent, and that for the most part, as you state on page 20, lines 5-9, of your testimony, "average days to delivery have been relatively stable over this time period." If not confirmed, please explain.

RESPONSE:

       Confirmed.

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SH/USPS-T5-5. Please discuss statistical challenges, such as those regarding confidence levels, and any other issues that may arise in making projections when there is only a single previous event (the 14.6 increase in delivery time in 2015) that is at all comparable to the event being analyzed (an increase in delivery time of 18 percent, the Postal Service's projection under the proposed changes).

RESPONSE:

Statistical estimates are most robust within the historical range of the variables for the time period over which such estimates are made.

Average days to delivery for First-Class Single-Piece Mail ranged from 1.70 days (in 2009Q3-4 and 2010Q3-4) to 2.5 days (in 2015Q2 and 2020Q4) over the time period over which I estimated the First-Class Single-Piece equations presented in my testimony. This is a range of 47 percent.

Average days to delivery for First-Class Workshare Mail ranged from 2.00 days (2013Q4, 2014Q3-4) to 2.40 days (2011Q2, 2013Q1-2, 2015Q2, 2020Q4) over the time period over which I estimated the First-Class Workshare equations presented in my testimony. This is a range of 20 percent.

The relative stability of the average days to delivery, on the other hand, is actually advantageous statistically. The greatest challenge in multi-variate regression analysis is to isolate the impact of one factor from the possible impact of other factors. This is most difficult if the explanatory variables are highly correlated with one another (so-called "multi-collinearity). If, for example, average days to delivery had a noticeable trend over time (either up or down), it would be difficult to isolate the impact of such a variable from the diversion trends already in the equation. But because average days to delivery have only changed significantly a small number of times over the time period which I evaluated, it is

easier to isolate and quantify the effect of delivery time on mail volumes independent of the other factors (e.g., diversion trends, the macro-economy, Postal prices) which have operated on mail volumes more regularly over the same time period.

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SH/USPS-T5-6. Please refer to your testimony, p. 37, lines 17-19, where you state that "the expected losses to First-Class Mail if average days to delivery increased by 18 percent would be 497.9 million pieces of mail, $241.4 million in gross revenue, and $105.6 million in lost contribution." Please confirm that these estimates refer only to the first full year following implementation of the new standards and that your analysis did not encompass what volume, revenue and contribution impacts might occur in subsequent years. If your analysis did encompass these impacts, please provide the results.

RESPONSE:

The expected losses which I calculated and discuss at page 37 of my testimony would apply to the first full year after all lagged reactions to changes in average days to delivery have had time to take effect. If average days to delivery remain at this new elevated level, it would be expected that any volume which was lost due to this factor would remain lost, but no additional losses would be expected to accrue if average days to delivery subsequently remained constant.